# DRAFT ECONOMIC ANALYSIS OF CRITICAL HABITAT DESIGNATION FOR THE CACTUS FERRUGINOUS PYGMY-OWL

Final Draft

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# PREFACE

The U.S. Fish and Wildlife Service has added this preface to all economic analyses of critical habitat designations:

"The standard best practice in economic analysis is applying an approach that measures costs, benefits, and other impacts arising from a regulatory action against a baseline scenario of the world without the regulation. Guidelines on economic analysis, developed in accordance with the recommendations set forth in Executive Order 12866 ("Regulatory Planning and Review"), for both the Office of Management and Budget and the Department of the Interior, note the appropriateness of the approach:

> *'The baseline is the state of the world that would exist without the proposed action. All costs and benefits that are included in the analysis should be incremental with respect to this baseline.'*

"When viewed in this way the economic impacts of critical habitat designation involve evaluating the 'without critical habitat' baseline versus the 'with critical habitat' scenario. Impacts of a designation equal the difference, or the increment, between these two scenarios. Measured differences between the baseline and the scenario in which critical habitat is designated may include (but are not limited to) changes in land use, environmental quality, property values, or time and effort expended on consultations and other activities by Federal landowners, Federal action agencies, and in some instances, State and local governments and/or private third parties. Incremental changes may be either positive (benefits) or negative (costs).

"In New Mexico Cattle Growers Ass'n v. U.S.F.W.S., 248 F.3d 1277 (10th Cir. 2001), however, the 10th Circuit recently held that the baseline approach to economic analysis of critical habitat designations that was used by the Service for the southwestern willow flycatcher designation was 'not in accord with the language or intent of the ESA.' In particular, the court was concerned that the Service had failed to analyze any economic impact that would result from the designation, because it took the position in the economic analysis that there was no economic impact from critical habitat that was incremental to, rather than merely co-extensive with, the economic impact of listing the species. The Service had therefore assigned all of the possible impacts of designation to the listing of the species, without acknowledging any uncertainty in this conclusion or considering such potential impacts as transaction costs, reinitiations, or indirect costs. The court rejected the baseline approach incorporated in that designation, concluding that, by obviating the need to perform any analysis of economic impacts, such an approach rendered the economic analysis requirement meaningless: 'The statutory language is plain in requiring some kind of consideration of economic impact in the CHD phase.'

"In this analysis, the Service addresses the 10th Circuit's concern that we give meaning to the ESA's requirement of considering the economic impacts of designation by acknowledging the uncertainty of assigning certain post-designation economic impacts (particularly section 7 consultations) as having resulted from either the listing or the designation. The Service believes that for many species the designation of critical habitat has a relatively small economic impact, particularly in areas where consultations have been ongoing with respect to the species. This is because the majority of the consultations and associated project modifications, if any, already consider habitat impacts and as a result, the process is not likely to change due to the designation of critical habitat. Nevertheless, we recognize that the nationwide history of consultations on critical habitat is not broad, and, in any particular case, there may be considerable uncertainty whether an impact is due to the critical habitat designation or the listing alone. We also understand that the public wants to know more about the kinds of costs consultations impose and frequently believe that designation could require additional project modifications.

"Therefore, this analysis incorporates two baselines. One addresses the impacts of critical habitat designation that may be 'attributable co-extensively' to the listing of the species. Because of the potential uncertainty about the benefits and economic costs resulting from critical habitat designations, we believe it is reasonable to estimate the upper bounds of the cost of project modifications based on the benefits and economic costs of project modifications that would be required due to consultation under the jeopardy standard. It is important to note that the inclusion of impacts attributable co-extensively to the listing does not convert the economic analysis into a tool to be considered in the context of a listing decision. As the court reaffirmed in the southwestern willow flycatcher decision, 'the ESA clearly bars economic considerations from having a seat at the table when the listing determination is being made.'

"The other baseline, the lower boundary baseline, will be a more traditional rulemaking baseline. It will attempt to provide the Service's best analysis of which of the effects of future consultations actually result from the regulatory action under review - i.e. the critical habitat designation. These costs will in most cases be the costs of additional consultations, reinitiated consultations, and additional project modifications that would not have been required under the jeopardy standard alone as well as costs resulting from uncertainty and perceptional impacts on markets."

DATED: March 20, 2002

# EXECUTIVE SUMMARY

1. The purpose of this report is to identify and analyze the potential economic impacts that may result from the proposed critical habitat designation for the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum)*. This report was prepared by Industrial Economics, Incorporated and Brookshire, McIntosh & Associates, LLC, for the U.S. Fish and Wildlife Service's Division of Economics.

2. Section 4(b)(2) of the Endangered Species Act (Act) requires the Service to designate critical habitat on the basis of the best scientific data available, after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in extinction of the species.

3. The focus of this economic analysis is on section 7 of the Act, which requires Federal agencies to insure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. Federal agencies are required to consult with the Service whenever they propose an action that may affect a listed species or its designated critical habitat. Because consultation under section 7 only applies to activities that are carried out, permitted, or funded by a Federal agency, the designation of critical habitat will not afford any additional protections for species with respect to such strictly private activities.

## Key Findings

4. High-end estimates of the economic impact associated with section 7 implementation in cactus ferruginous pygmy-owl critical habitat areas range from $76 million to $92 million (or $11 million annually).[1] While a range of activities may incur section 7 impacts associated with the designation of critical habitat for the pygmy-owl, 80 percent of the designation costs are expected to stem from potential mitigation efforts and administrative costs associated with consultations on residential development projects in areas proposed for designation.

5. Given the availability of *substitute* housing sites in the study area, total residential development (i.e., the number of new housing units constructed) is not likely to decline as a result of the critical habitat designation for the pygmy-owl. It is likely, however, that project delays and required project modifications will result in some impacts (or increased

[1] This estimates have been converted to present values using seven percent and three percent discount rates, respectively. Of the total section 7 costs, approximately $36 million to $44 million (or $5 million annually) are expected to be attributable solely to critical habitat designation.

costs) either to the land owner/seller, the land developer, or (possibly) the housing consumer. For example, if the full measure of these costs is borne by the land owner/seller in a designated critical habitat, then the value of the land is likely to decrease; that is, the seller will receive a lesser price under the designation for the same land. Alternatively, if the full measure of these costs is borne by the land developer, then the total dollar *revenues* to the developer could decrease by approximately three to eight percent (as much as $7,000 to $12,000 per home). Thus, in this scenario the developer experiences lower profit margins, but the price to the home buyer remains the same.

6. In the event that the housing consumer bears the full measure of these cost impacts by virtue of purchasing a home in a critical habitat designation area, the purchaser could experience an increase in home prices with a concurrent increase in amenities, including more open space or larger lot size. It is important to note, however, that these amenities may be offset by *disamenities*, including a decrease in actual home size (i.e., in square footage). Analysis suggests that consumers in the immediate area surrounding the critical habitat are not likely to experience a comparable increase in home prices.

7. Exhibit ES-1 presents a summary of potential economic impacts to the residential development sector due to the critical habitat designation for the pygmy-owl, and describes how these impacts are addressed in this analysis.

## Costs Associated with the Area Proposed for Designation

8. Results of the economic analysis of section 7 activity associated with areas proposed for designation as critical habitat for the pygmy-owl are summarized below:

- **Residential/Housing Development.** Residential development is the activity most likely to result in consultations associated with areas proposed as critical habitat. The Action agencies for these consultations will be the Army Corps of Engineers (ACOE) and/or the U.S. Environmental Protection Agency (EPA). As much as 43 percent of future section 7 consultations may address residential development activities (estimated at 13 to 33 consultations over 10 years).

- **Farming and Livestock Grazing.** Farming and livestock grazing activities may also be subject to future consultations and project modifications through reinitiation of consultations on large land management programs run by the Bureau of Land Management (BLM) . The total cost of project modifications associated with these activities is expected to be modest; the Service generally finds these activities to be compatible with pygmy-owl habitat requirements.

- **Mining.** Future consultations may occur associated with copper or other mining activities in pygmy-owl habitat on Federal lands. While the Service has generally determined that mining activities are incompatible with pygmy-owl critical habitat, little information is available on requirements the Service may impose on such

activities. More importantly, though numerous claims exist on BLM lands, few mining activities are ongoing within the boundaries of critical habitat.

**Exhibit ES-1**

**SUMMARY OF POTENTIAL CATEGORIES OF ECONOMIC IMPACT TO RESIDENTIAL DEVELOPMENT SECTOR: PYGMY-OWL HABITAT DESIGNATION**

| Category | Inclusion in this Analysis | Description |
|---|---|---|
| Reduced revenues to landowners, developers and builders | Included | Estimated reduction in profits associated with project modifications |
| Off-site mitigation costs | Included | Estimated costs to purchase mitigation lands |
| Project Delays | Included | Estimated costs of delay in receipt of revenues |
| Increased value of new homes within critical habitat | Not Included | Given reduction in density of development, homes in developments that are required to perform on-site mitigation may sell for more than homes in developments without such on-site open space |
| Increased housing prices in region | Not Included | Not anticipated to occur given availability of developable land in the region and modest overall reduction in number of units constructed (less than 5 percent of total expected supply of new homes in Eastern Pima County may be affected) |
| Regional economic impacts | Not Included | Estimated to be insignificant due to large availability of substitute housing sites; distributed throughout the metropolitan area. Economic impacts are less than one percent of total development value |
| Secondary impacts to construction-related industries | Not Included | Not assumed to be significant given modest reduction in number of units constructed |
| Reduced Tax Revenue to Local Government | Not Included | For small changes in number of housing units constructed, analysis assumes that any changes in tax revenue will be offset by an equal change in municipal expenses |

- **Construction and Maintenance of Roads and Utilities**. A small number of ongoing and future road projects are likely to involve consultation with the Service and the Federal Highway Administration (FHWA), ACOE, or EPA over the next ten years. In addition, three planned utility projects may result in consultation with the Department of Energy (DOE), EPA, U.S. Forest Service, or Rural Utilities Service.

- **Other Federal Activities.** Several consultations are anticipated with Federal entities that are unlikely to involve third parties or significant project modifications. These include: consultations on Border Patrol activities with the Immigration and Naturalization Service (INS), park management issues with the National Wildlife Refuge division of the Service, and the National Park Service (NPS).

**Benefits Associated with Protection of the Area Proposed as Critical Habitat**

9. Certain categories of benefit may derive from the listing of the pygmy-owl and the designation of critical habitat. Survival and recovery of the species may lead to benefits such as enhanced existence values and increased opportunities for bird-watching.[2] Protecting pygmy-owl habitat may produce benefits such as increased opportunities for desert recreational activities such as hiking and horseback riding, enhanced real estate prices, increased ecosystem health, and enhanced values for the desert ecosystem in south-central Arizona. Insufficient information exists to quantify the benefits of habitat protection. However, several willingness-to-pay studies reported in the economics literature attempt to estimate the non-use value the public holds for preservation of various species of birds, and in particular, the designation of critical habitat to protect a bird species. Non-use values represent the public's willingness-to-pay to preserve a species or enhance a species' population above and beyond any direct use. While these studies do not predict the willingness to pay individuals would have for the protections afforded to the pygmy-owl through section 7 of the Act, they support the notion that preservation of the pygmy-owl may generate substantial benefits to the public.

**Summary**

10. While the total economic costs associated with section 7 implementation for the pygmy-owl are large in absolute terms, these costs are modest in the context of overall economic activity that is predicted to occur over the next ten years in the region. In Pima and Pinal Counties, where critical habitat for the pygmy-owl is proposed, annual income and spending exceeded $22 billion annually in 2000. Thus, the estimated upper-bound section 7 costs associated with the listing and proposed critical habitat designation of $11 million annually represents less than 0.1 percent of the total value of economic activity in this region. Additionally, in Pima and Pinal Counties, annual revenues in the construction industry alone are expected to be over $1 billion annually. Thus, the estimated upper bound section 7 costs associated with the listing and proposed critical habitat designation for

[2] The Service discourages birding enthusiasts from viewing pygmy-owls because of the high potential for disturbance. Written Communication with Service, Tucson Ecological Services Field Office, October 2002.

residential development could represent 1.1 percent of the total annual construction revenues for Pima and Pinal Counties.[3]

11. Exhibit ES-2 provides an overview of the total Section 7 costs associated with the listing and designation of critical habitat for the pygmy-owl over a ten year period. Approximately 47 percent of the total Section 7 costs are determined to be attributable to the critical habitat designation, as described in detail in Section 5.13. Exhibit ES-2 provides a more detailed per unit summary of the consultation and technical assistance costs associated with activities within or affecting the proposed critical habitat designation for the pygmy-owl over a ten-year period.

**Exhibit ES-2**

**SECTION 7 COSTS ATTRIBUTABLE TO LISTING & CRITICAL HABITAT (10 YEARS)**

| | **Total Section 7 Costs** | | **Attributable Solely to Critical Habitat** | |
|---|---|---|---|---|
| | **Low** | **High** | **Low** | **High** |
| *Total Costs (2002 dollars)* | *$70,000,000* | *$108,000,000* | *$33,320,000* | *$51,830,000* |
| Present Value (7%) | $49,410,000 | $76,140,000 | $23,400,0000 | $36,400,000 |
| Present Value (3%) | $60,000,000 | $92,480,000 | $28,420,000 | $44,210,000 |
| Annualized | $7,040,000 | $10,840,000 | $3,330,000 | $5,180,000 |

Note: This table presents nominal costs as well as the discounted present value of total costs based on the OMB prescribed seven percent discount rate as well as a three percent discount rate, with the assumption that total costs are distributed evenly over the ten-year period. Discounted costs are then annualized assuming that total costs will be evenly distributed across the ten-year period.

12. Exhibit ES-3 provides a more detailed summary of the consultation and technical assistance costs likely to be associated with section 7 implementation for the pygmy-owl in critical habitat areas over a ten-year period (table presentation is in 2002 dollars). As is shown, over 80 percent of estimated costs are expected to be associated with residential housing development activities, with these costs primarily borne by activities in Units 2 and 3 (together comprising approximately 64 percent of estimated total costs of the designation).

[3] U.S. Bureau of Economic Analysis, "Regional Accounts Data: Local Area Personal Income," http://www.bea.doc.gov/bea/regional/reis/.

**Exhibit ES-3**

**TOTAL SECTION 7 COSTS ASSOCIATED WITH ACTIVITIES AFFECTING PROPOSED CRITICAL HABITAT FOR THE PYGMY-OWL (TEN YEARS)**

| Unit | Activity | Number of Formal Consultations (10 years) | Total Costs (2002 dollars) | |
|---|---|---|---|---|
| | | | Low | High |
| 1 | Housing Development | 1 to 2 | $3,430,000 | $5,360,000 |
| | Livestock grazing | 0.25 | $10,000 | $10,000 |
| | INS | 2 | $30,000 | $90,000 |
| | Parks, Monuments and Refuges | 12 | $180,000 | $640,000 |
| | Utilities Construction | 1 | $30,000 | $80,000 |
| **Total** | | **16 to 17** | **$3,680,000** | **$6,180,000** |
| 2 | Housing Development | 4 to 11 | $18,850,000 | $29,470,000 |
| | Livestock grazing | 0.25 | $10,000 | $10,000 |
| | INS | 1 | $10,000 | $50,000 |
| | Mining | 2 | $40,000 | $130,000 |
| | Parks, Monuments and Refuges | 2 | $30,000 | $110,000 |
| | Road Construction | 1 | $120,000 | $900,000 |
| | Utilities Construction | 1 | $30,000 | $80,000 |
| **Total** | | **11.25 to 18.25** | **$19,090,000** | **$30,750,000** |
| 3 | Housing Development | 5 to 13 | $22,270,000 | $34,830,000 |
| | Livestock grazing | 0.25 | $10,000 | $10,000 |
| | Road Construction | 4 | $470,000 | $3,590,000 |
| | Utilities Construction | 1 | $30,000 | $80,000 |
| **Total** | | **10.25 to 18.25** | **$22,780,000** | **$38,510,000** |
| 4 | Housing Development | 3 to 7 | $11,990,000 | $18,760,000 |
| | Livestock grazing | 0.25 | $10,000 | $10,000 |
| | Mining | 2 | $40,000 | $130,000 |
| | Road Construction | 1 | $120,000 | $900,000 |
| **Total** | | **6.25 to 10.25** | **$12,160,000** | **$19,800,000** |

**Exhibit ES-3**

**TOTAL SECTION 7 COSTS ASSOCIATED WITH ACTIVITIES AFFECTING PROPOSED CRITICAL HABITAT FOR THE PYGMY-OWL (TEN YEARS)**

| | | | | |
|---|---|---|---|---|
| 5 | Livestock grazing | 1 | $30,000 | $60,000 |
| | Mining | 2 | $40,000 | $130,000 |
| | INS | 2 | $30,000 | $90,000 |
| | Parks, Monuments and Refuges | 8 | $120,000 | $430,000 |
| **Total** | | **13** | **$220,000** | **$710,000** |
| Informal Consultations | | 100 | $1,550,000 | $1,550,000 |
| Technical Assistance | | 5,000 | $10,900,000 | $10,900,000 |
| **TOTAL** | | | **$70 million** | **$108 million** |

Sources: IEc Economic Analysis.
[a]When no third party is involved it is assumed that the formal consultation cost is the sum of the Service and Action Agency cost.
Notes: Any potential future consultation or other impact attributable to critical habitat presumes a pre-existing Federal nexus as identified in the preceding column. Totals may not sum due to rounding.

## Key assumptions

13. Exhibit ES-4 presents the key assumptions of this economic analysis, as well as the potential direction of relative scale of bias introduced by the assumption. For example, the analysis assumes that the frequency of consultations will continue at historical rates in the future, while there is some indication that informal consultations and technical assistance effort may decline in the future, reducing the ultimate cost of the designation.

**Exhibit ES-4**
**CAVEATS TO THE ECONOMIC ANALYSIS**

| Key Assumption | Effect on Cost Estimate |
|---|---|
| Consultation rates will not decrease over time | ++ |
| The presence of other species (i.e. Pima pineapple cactus, lesser long nosed bat) has no influence on consultation/project modification costs | + |
| All delays and mitigation efforts associated with modifications to development plans during the consultation process are attributable to section 7 implementation for the pygmy-owl, and not to other pre-existing constraints on development (particularly stringent mitigation targets for permitted development in many areas of Pima County). | ++ |
| All future developments will be part of large-scale developments that will be subject to consultation | ++ |
| Developers will not account for any prospective delays to process as part of their planning efforts | +++ |
| There are no benefits to housing sale price of preserving open space on-site or having a larger lot with natural lands. | ++ |
| A developer will realize an average profit of 5-10% of each future home sales price | ? |
| Historic administrative consultation costs and specific project modifications are good predictors of future consultation behavior | ? |
| Historic consultations of residential developments are good indicators of future development types as far as number of units per development, median home price, etc. | ? |
| Density of future development will remain the same after project modifications are imposed due to critical habitat. | ? |
| Substitute development lots exist to offset loss units of development within critical habitat areas | - |

- : This assumption may result in an underestimate of real costs.
+ : This assumption may result in an overestimate of real costs.
? : This assumption has an unknown effect on estimates.

## INTRODUCTION AND BACKGROUND SECTION 1

14. In 2002, the U.S. Fish and Wildlife Service (the Service) proposed designating critical habitat for the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum)* on approximately 1,208,000 acres in Pima and Pinal Counties, Arizona. The purpose of this report is to identify and analyze potential economic impacts that could result from the proposed critical habitat designation. This report was prepared by Industrial Economics, Incorporated (IEc), under contract to the Service's Division of Economics.

15. The final rule listing the pygmy-owl as endangered in Arizona (62 FR 10730) was published March 10, 1997. In that final rule critical habitat designation for the Arizona population was found to be not prudent. On October 31, 1997, the Southwest Center for Biological Diversity filed suit against the Service for failure to designate critical habitat for the pygmy-owl.[4] On October 7, 1998 an order was issued that required the proposal of critical habitat. On July 12, 1999, the final critical habitat was published (64 FR 37419). On January 9, 2001, a coalition of plaintiffs filed a lawsuit challenging the validity of the Service's listing of the Arizona population of the pygmy-owl as an endangered species and the designation of its critical habitat. On September 21, 2001, the designation of critical habitat was vacated, while the listing of the pygmy-owl in Arizona was upheld. This analysis responds to that court order.[5]

16. Section 4(b)(2) of the Endangered Species Act (the Act) requires that the Service base the designation of critical habitat upon the best scientific and commercial data available, after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas as critical habitat, provided the exclusion will not result in extinction of the species.

17. Under the listing of a species, section 7(a)(2) of the Act requires Federal agencies to consult with the Service in order to ensure that activities they fund, authorize, permit, or carry out are not likely to jeopardize the continued existence of the species. The Service defines

[4] Southwest Center for Biological Diversity v. Babbitt, Civ. 97-704 TUC ACM.

[5] National Association of Home Builders et al. v. Norton, Civ.-00-0903-PHX-SRB.

jeopardy as any action that would appreciably reduce the likelihood of both the survival and recovery of the species. For designated critical habitat, section 7(a)(2) also requires Federal agencies to consult with the Service to ensure that activities they fund, authorize, permit, or carry out do not result in destruction or adverse modification of critical habitat. Adverse modification of critical habitat is currently construed as any direct or indirect alteration that appreciably diminishes the value of critical habitat for conservation of a listed species.

## 1.1 Description of Species and Habitat

18. The pygmy-owl is a small bird, approximately 6 3/4 inches long, averaging between 2.2 and 2.6 ounces. The bird is reddish-brown overall, with a cream-colored belly streaked with reddish-brown. The crown is lightly streaked, and paired black-and-white spots on the nape suggest eyes. There are no ear tufts, and the eyes are yellow. The tail is relatively long for an owl and is colored reddish-brown with darker brown bars. The call of this diurnal owl, heard primarily near dawn and dusk, is a monotonous series of short notes.

19. The cactus ferruginous pygmy-owl is one of four subspecies of the ferruginous pygmy-owl. It occurs from lowland central Arizona south through western Mexico, to the States of Colima and Michoacan, and from southern Texas south through the Mexican States of Tamaulipas and Nuevo Leon.

20. In determining which areas to propose as critical habitat, the Service must consider those physical and biological features that are essential to the survival and recovery of the species. The following are the primary constituent elements that the Service has identified as critical to the survival of the pygmy-owl:

- elevations below 1,200 m (4,000 ft) within the biotic communities of Sonoran riparian deciduous woodlands, Sonoran riparian scrubland, xeroriparian communities, mesquite bosques, tree-lined drainages in semidesert, Sonoran savanna, and mesquite grasslands and the Arizona Upland and Lower Colorado River subdivisions of Sonoran desertscrub;

- nesting cavities located in trees including, but not limited to cottonwood, willow, ash, mesquite, palo verde, ironwood, and hackberry with a trunk diameter of 15 cm (6 in) or greater measured 1.4 m (4.5 ft) from the ground, or large columnar cactus such as saguaro or organ pipe greater than 2.4 m. (8 ft.);

- multilayered vegetation provided by trees and cactus in association with shrubs such as acacia, prickly pear, desert hackberry, graythorn, etc. and ground cover such as triangle-leaf bursage, burro weed, grasses or annual plants; and

- vegetation providing mid-story and canopy level cover in a configuration and density compatible with pygmy-owl flight and dispersal behaviors;

- habitat elements configured in a way so that unimpeded use, based on pygmy-owl behavioral patterns (typical flight distances, activity level tolerance, etc.), can occur during dispersal and within the home range.

## 1.2 Proposed Critical Habitat

21. The Service has proposed critical habitat designation for the pygmy-owl on approximately 1,208,000 acres of land in Pima and Pinal Counties, Arizona. Approximately 692,214 acres, or roughly 57 percent are located on federally-owned or managed lands; 350,572 acres (29 percent) are owned by the State or local authorities; 145,124 acres (12 percent) are located on private lands; and 20,091 (2 percent) of the total acreage proposed are located on other lands. The majority of lands included in this designation are currently undeveloped.

22. A more detailed description of each critical habitat unit is provided below:

- **Unit 1:** Unit 1 extends from the Mexican border northward approximately 80 km (50 miles) through the Altar Valley along the eastern edge of the Tohono O'odham Nation.

- **Unit 2:** Unit 2 is connected to the northern portion of Unit 1 and the Tohono O'odham Nation, extending from the western part of Saguaro National Park westward to the Tohono O'odham Nation, then northward and eastward across Interstate 10 to join Unit 3. A narrow strip of land connects the Marana and Tucson areas with the western unit of Saguaro National Park.

- **Unit 3:** Unit 3 lies primarily northeast of Interstate 10 and extends from northwest Tucson into southern Pinal County.

- **Unit 4:** Unit 4 encompasses the northernmost extent of this critical habitat proposal, running from the north edge of CHU 3 northward to an area approximately 14.4 km (9 mi) north of Park Link Drive..

- **Unit 5:** Unit 5 extends from the Mexican border northward along the western edge of the Tohono O'odham Nation.

## 1.3 Framework for Analysis

23. The focus of this economic analysis is on section 7 of the Act, which requires Federal agencies to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. Federal agencies are required to consult with the Service whenever they propose an action that may affect a listed species or its designated critical habitat. Aside from the protection that is provided under section 7, critical habitat does not provide other forms of protection to designated lands. Because consultation under section 7 only applies to activities that are carried out, permitted, or funded by Federal agencies, the designation of critical habitat will not afford any additional protections for species with respect to strictly private activities.

24. This analysis first identifies land use activities within or in the vicinity of those areas being proposed for designation that are likely to be affected by section 7 of the Act. To do this, the analysis evaluates a "without section 7" scenario and compares it to a "with section 7" scenario. The "without section 7" scenario constitutes the baseline of this analysis. It represents the level of protection that would be afforded the species under the Act if section 7 protective measures were absent. This level of protection includes other Federal, State, and local laws. The "with section 7" scenario identifies activities likely to involve a Federal nexus that may affect the species or its designated critical habitat, which accordingly have the potential to be subject to future consultations under section 7 of the Act.

25. Economic activities identified as likely to be affected under section 7 and the resulting impacts that section 7 can have on such activities constitute the upper-bound estimate of the effects of the proposed designation. By defining the upper-bound estimate to include both jeopardy and adverse modification provisions of section 7, the analysis recognizes that, in some cases, it may be difficult to differentiate between the two sources of impact. This approach is adopted in order to ensure that any critical habitat impacts that may occur co-extensively with the listing of the species (i.e., jeopardy) are not overlooked in the analysis.

26. Upon identifying section 7 impacts, the analysis proceeds to consider the subset of impacts that can be attributed exclusively to the designation. To do this, the analysis adopts a "with and without critical habitat approach." This approach is used to determine those effects found in the upper-bound estimate that may be attributed solely to the proposed designation of critical habitat. Specifically, the "with and without critical habitat" approach considers section 7 impacts that will likely be associated with the implementation of the *jeopardy* provision of section 7 and those that will likely be associated with the implementation of the *adverse modification* provision of section 7. In many cases, impacts associated with the jeopardy standard remain unaffected by the designation of critical habitat and thus would not normally be considered an effect of a critical habitat rulemaking. The subset of section 7 impacts likely to be affected solely by the designation of critical habitat represents the lower-bound estimate of this analysis.

27. The critical habitat designation for the pygmy-owl encompasses land under private, State/local, and Federal ownership. Federal lands being designated are managed by the Service, the National Park Service, Bureau of Land Management, Bureau of Reclamation, Bureau of Indian Affairs, Rural Utilities Service,, Immigration and Naturalization Service, Federal Highway Administration, and the Federal Emergency Management Agency. For private lands subject to critical habitat designation, section 7 consultations and modifications to land uses and activities can only be required when a Federal nexus, or connection, exists. A Federal nexus arises if the activity or land use of concern involves Federal permits, Federal funding, or another form of Federal involvement. Section 7 consultations are not required for activities on non-Federal lands that do not involve a Federal nexus.

28. In addition to the lands contained within the proposed critical habitat designation, this report examines adjacent activities sponsored or permitted by Federal agencies that may affect the pygmy-owl and/or adversely modify the proposed critical habitat area.

29. This report considers impacts that are "reasonably foreseeable," including, but not limited to, activities that are currently authorized, permitted, or funded, or for which plans are currently available to the public. Accordingly, the analysis bases estimates on activities that are likely to occur within a ten-year time horizon.[6]

## 1.4 Methodological Approach

30. This report relies on a sequential methodology that focuses on distilling the salient and relevant aspects of potential economic impacts of designation. The methodology consists of:

- Determining the current and projected economic activity within and around the proposed critical habitat area;
- Considering how current and future activities that take place or will likely take place on the Federal and private land could adversely affect proposed critical habitat;
- Identifying whether such activities taking place on privately-owned and state-owned property within the proposed critical habitat boundaries are likely to involve a Federal nexus;
- Evaluating the likelihood that identified Federal actions and non-Federal actions having a Federal nexus will require consultations under section 7 of

[6] A ten year projection was selected for various reasons. Historic growth rates within the study area are expected to continue apace during this period. However, it is difficult to predict the location of this growth for more than 10 years.

the Act and, in turn, that such consultations will result in modifications to projects;

- Estimating per-unit costs of expected section 7 consultations, project modifications and other economic impacts associated with activities in or adjacent to areas proposed as critical habitat;

- Estimating the upper bound costs associated with the area proposed for the designation (including costs that may be attributed co-extensively with the listing of the species) and the lower bound of these costs (i.e., costs attributable solely to critical habitat) over and above what would have occurred without section 7 implementation for the pygmy-owl;

- Determining the benefits that may be associated with the designation of critical habitat; and

- Assessing the extent to which critical habitat designation will create impacts on small businesses and/or affect property values as a result of modifications or delays to projects.

## 1.5 Information Sources

31. The primary sources of information for this report were communications with the Service, BLM, Pima County, the Town of Marana, local developers, the Arizona Game and Fish Department, Buenos Aires National Wildlife Refuge, Saguaro National Park West, and Cabeza Prieta National Wildlife Refuge. Publicly available data were also used to augment the analysis. Data was gathered from the Arizona Game and Fish Department, including its Arizona Heritage Data Management System, Defenders of Wildlife, Pima County, Pinal County, U.S. Census Bureau QuickFacts, U.S. Census Bureau, 2000 Census, the Town of Tortolita, and the Arizona State Parks Growing Smarter Grants Web Sites.

32. This analysis also relies upon county and city general plans for information about projected land use. The plans used in the analysis include the Pinal County Comprehensive Plan (2001), Pima County Comprehensive Plan & Update (2001), Listed Species Reserve Analysis: Sonoran Desert Conservation Plan (2002), and the Marana General Plan (1997).

33. This section discusses the socioeconomic characteristics of regions containing proposed critical habitat for the pygmy-owl. In addition, it provides information on regulations and requirements that exist in the baseline (i.e., the "without section 7" scenario), and thus are likely to impact activities affecting the proposed designation.

## 2.1 Socioeconomic Profile of Areas with Proposed Critical Habitat

34. This section summarizes key economic and demographic information for Pima and Pinal Counties and for the major towns that may be impacted by the designation of critical habitat for the pygmy-owl. County level data are presented to provide context for the discussion of potential economic impacts due to critical habitat designation, and to illuminate trends that may influence these impacts.[7]

### 2.1.1 Pima County

35. Pima County encompasses 1,984 square miles in southern Arizona. The San Xavier, Pascua Yaqui and Tohono O'Odham reservations together account for 42.1 percent of the county's land area. Lands owned by the State of Arizona account for 14.9 percent; lands managed by the U.S. Forest Service and Bureau of Land Management, 12.1 percent; other publicly managed lands, 17.1 percent; and individual or corporate ownership, 13.8 percent.[8]

[7] Population summaries are derived primarily from: U.S. Bureau of Economic Analysis Regional Accounts Data. Accessed at: http://www.bea.doc.gov/bea/regional/data.htm, unless specified otherwise.

[8] Pima County Comprehensive Plan Update, Pima County Board of Supervisors, December 18, 2001.

36. With 848,642 residents, or 15.6 percent of the state population, Pima is the second most populous of the 15 counties in the state. According to the Land Use Element of the Pima County Comprehensive Plan, growth areas within Pima County are within the cities of Tucson, Marana, Oro Valley, Sahuarita, and South Tucson. Planners in Pima County expect the steady growth in population that has occurred in the county for the past 40 years to continue. The county's population is projected to increase to approximately 1,031,623 (19 percent) by 2010, and to approximately 1,206,244 (39 percent) by 2020. Pima County officials expect that this growth will require roughly 4,500 acres of land per year.[9]

37. In unincorporated Pima County, the bulk of developed land is used for residential purposes. Single family homes represent 60 percent of the homes in Pima County, compared to the national average of 80 percent. Census 2000 data indicate that Pima County contained 366,737 total housing units in 2000, up from 105,000 units in 1990 (an increase of approximately 250 percent). The census also revealed that in 2000 the county's median household income was $35,550, while 30 percent of households reported an income below the census poverty level. Real estate market forces in the area have served higher income residents of the County, creating an affordability gap in housing that has led to rapid expansion of unregulated wildcat development.[10] Pima County has issued more than 4,700 permits annually for all residential developments since 1970, with highs of over 15,000 permits granted in 1972 and 1986.[11]

38. In 2000, Pima County had a total personal income of $20 billion with a per capita personal income (PCPI) of $23,705. Pima's PCPI was five percent lower than the state average ($24,988) and 20 percent lower than the national average ($29,469). The average annual income growth rate over the past 10 years was 3.9 percent, which is slightly above the average annual growth rate for the state (3.8 percent), but below that of the nation (4.2 percent). Thirty-two percent of county employment falls within the service industry, 14.4 percent of residents are employed by state and local government, and 12.6 percent are employed in the manufacturing sector.

39. Pima County's Mountain Park system allows a significant portion of the county to be set aside as mountain parks and natural preserves. The system consists of Tucson Mountain Park, Tortolita Mountain Park, and Colossal Cave Mountain Park. In addition, the county owns the Cienega Creek Natural Preserve, Agua Caliente Park, Arthur Pack Park, and Canoa Ranch.

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[9] Pima County, *Pima County Comprehensive Plan Update*, adopted December 18, 2001.

[10] Unregulated development, or "wildcatting", occurs when landowners split and sell lots for new homes. These wildcat subdivisions do not generally have sewer services, storm drainage systems, or paved roads.

[11] Ibid.

### 2.1.2 Marana

40. Marana, a town located in northwestern Pima County, was incorporated in 1977. At that time, the town limits included slightly less than ten square miles. By 2002, the town had grown to approximately 115 square miles. Though agriculture is still important to the town's economy, Marana has grown significantly since its beginnings as a farming community of 1,512 people. The town's population was 13,556 in 2000, a population increase of almost 800 percent in 23 years.[12]

41. The median age of Marana's population in 2000 was 34.5 years. The median household income in 2000 was reported to be approximately $22,245 which is six percent less than the county average ($23,705). Nearly 83 percent of Marana's residents lived in owner-occupied housing. These facts indicate that housing in Marana at the time was relatively affordable.[13]

42. The original town site continues to be primarily agricultural and is composed of low-density development, characteristic of the area west of Interstate 10 (I-10). Planned communities such as Continental Ranch and Dove Mountain, which tend to be denser, are typical of new suburban development. Industrial and commercial uses have followed the I-10 corridor, and tourist-oriented facilities are located around the highway interchanges. Five percent of Marana's land is residential, 1.2 percent is commercial, 1.9 percent is industrial, and 21.9 percent is used for agriculture.[14]

43. The Pima Association of Governments estimates that Marana's population will increase to 37,170 by 2010.[15] A portion of this population growth may be attributable to the expansion of Marana's town limits. The Marana General Plan anticipates that housing will represent the majority of new land use in the next decade. As stated by Marana residents, business people, and the General Plan Advisory Committee members in 1997, the preferred future development pattern consists of neighborhood clusters surrounded by low-density housing and extensive open space. The town has targeted Northwest Marana, a portion of the town not included in the critical habitat designation, as the prime growth area in the next decade. The South Central area, which is partially contained in the proposed designation, will contain several master planned communities and residential subdivisions, as well as commercial facilities along the major transportation corridors. The General Plan recognizes the special environmental resources in this area, and thus proposes that future development must be carefully integrated in an environmentally sensitive way. Marana recently annexed

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[12] Note that this figure is somewhat misleading because of the large expansion in the geographic size of the town (Tetra Tech, Incorporated, *Marana General Plan*, April, 2002).

[13] Ibid.

[14] Ibid.

[15] Tetra Tech, Incorporated, *Marana General Plan*, April, 2002.

40 square miles of Arizona State Trust Land along its northern boundary. This newly acquired land is intended to be purchased as mitigation lands for the purposes of preserving open space and recreational activity.[16]

### 2.1.3 Oro Valley

44. Incorporated in 1974, Oro Valley is in northwestern Pima County, six miles north of Tucson's city limits. The valley, surrounded by the Catalina Mountains, encompasses over 31 square miles. The current population of Oro Valley is approximately 30,000, growing rapidly from a 1990 population of 6,670. Oro Valley's population accounts for approximately 3.5 percent of Pima County's population. By 2010, population is expected to exceed 44,190.[17]

45. The average per capita income of Oro Valley is $31,134 while the median household income is $67,562. The principal economic activities of Oro Valley include manufacturing, construction, and tourism-related services.

46. Oro Valley has experienced rapid economic growth in the past decade, with the population increasing nearly 345 percent from 1990 to 2000. Various indicators reveal that the valley continues to experience rapid growth and development. Commercial construction has increased more than 300 percent since 1990 and the number of building permits issued increased from 494 in 1990 to 1,020 in 1999.[18]

### 2.1.4 Tortolita

47. Tortolita is located a few miles north of Tucson and is bordered by Pinal County to the north, Oro Valley to the east, and Marana to the west. It encompasses approximately 22 square miles. The total population of Tortolita in 2000 was 3,740, less than one percent of Pima County's total population. The average per capita income in 2000 was $25,550.[19]

48. The Tortolita Mountain area is the least developed of the mountain ranges near Tucson. Tortolita is primarily rural, with services, including recreational services,

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[16] Ibid.

[17] Pima Association of Government, Population Estimates, Projections, and Growth Rates http://www.pagnet.org/Population/census/PopulationData/Pop_Growth_Rates.htm

[18] Ibid.

[19] U.S. Census Bureau, Census 2000. Tortolita CPD, Arizona, www.ci.tucson.az.us/planning/1600474975.pdf.

accounting for 27 percent of the job-base[20] The town is increasingly becoming a site for real estate development, particularly luxury homes. Currently there are 1,408 housing units, and several developments are expected in the foothills. These developments would include up to 180 homes on over 1,025 acres. The developers hope to preserve Tortolita's natural scenery by building small homes on large lots.[21]

### 2.1.5 Pinal County

49. Pinal County encompasses 5,370 square miles north of Pima County. State of Arizona managed lands account for 35.3 percent of Pinal County, while private ownership accounts for 25.8 percent. Native American Tribal lands account for 20 percent of county lands, and Federal agencies control 17.8 percent. The eastern portion of Pinal County is characterized by mountains and copper mining while the western area is characterized by low desert valleys and irrigated agriculture.[22]

50. In 2000, Pinal had a total personal income of $2.6 billion with a per capita personal income of $14,506. Pinal's per capita income was 42 percent lower than the state average ($24,988) and 51 percent lower than the national average ($29,469). The average annual income growth rate over the past 10 years was 1.8 percent, which is below the average annual growth rate for the state (3.8 percent) and below that of the nation (4.2 percent). Approximately 25.9 percent of residents are employed by state and local government, 23.7 percent within the service industry and 9.6 percent in agriculture.[23]

51. Pinal County's 2001 Comprehensive Plan states that the county is experiencing rapid growth and transition from a primarily agricultural center to a commercial, industrial and recreational centered economy. In 2001, the population of the county totaled 179,727, accounting for 3.4 percent of the state population. From 1990 to 2000, the population of Pinal County increased 54.4 percent, a rate higher than the state wide percent change of 40 percent.[24] Pinal County projects a 60 percent increase in population in the next decade with annual growth projected at 6 percent. Urban areas are currently experiencing the most intense

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[20] Ibid.

[21] Juarez, Macario Jr,"Houses will cost you extra in Tortolita foothills plan - Million-dollar lots", Arizona Daily Star Newspaper, January 6, 2002.

[22] Pinal County, *Pinal County Comprehensive Plan*, adopted January 19, 2002.

[23] Pinal County, Arizona - U.S. Census Bureau QuickFacts, http://quickfacts.census.gov/qfd/states/04/04021.html, Accessed on July 24, 2002.

[24] Ibid.

commercial and residential development, but the Comprehensive Plan anticipates that many rural areas will grow rapidly in the next decade.[25]

## 2.2 Baseline Elements

52. "Baseline elements" consist of those regulations, guidelines, and/or policies that may afford protection to the pygmy-owl in the absence of section 7 implementation or which may require similar administrative action. For example, these regulations may influence development patterns and/or affect the section 7 consultation process. This discussion focuses on the several important regulatory elements that have bearing on this analysis.

### 2.2.1 Overlap with Other Listed Species

53. If a consultation is triggered for any listed species the consultation will generally take into account all other federally-listed species known or thought to occupy areas affected by the proposed action. For example, the Tucson field office of the U.S. Fish and Wildlife Service has conducted formal consultations on the pygmy-owl in combination with several species, including the federally-listed lesser long nosed bat (*Leptonycteris curasoae yerbabuenae)* and the Pima pineapple cactus (*Coryphantha scheer* var. *robustispina*).

54. Most past consultations on the pygmy-owl have involved at least one or two other species. Thus, the cost of a consultation that involves the pygmy-owl may not be fully attributable to the presence of this species or its habitat. Nonetheless, because consultations must consider project-related effects to each listed species separately, a certain amount of research and time will be spent on the pygmy-owl regardless of the presence of other species. In order to present an upper bound estimate of the economic impacts associated with the implementation of section 7, this analysis assumes that all future section 7 consultations within the extant boundaries of the proposed critical habitat are fully attributable to the presence of the pygmy-owl and its habitat.

### 2.2.2 State Statutes and Regulations

**State-Level Endangered Species Protection: Wildlife Species of Special Concern**

55. The Arizona Game & Fish Department (Department) assists the Service in providing protection for wildlife species in Arizona that carry a Federal designation under the Endangered Species Act. The Department's Wildlife Species of Special Concern includes species whose occurrence in Arizona is or may soon be in jeopardy from known or perceived threats, or whose populations are in decline. While the Department acts primarily through

[25] Pinal County, *Pinal County Comprehensive Plan*, adopted January 19, 2002.

promoting and enforcing hunting and fishing regulations, general provisions for species of concern include protecting the quality, diversity, abundance, and serviceability of habitats for the purposes of maintaining or recovering populations of Arizona wildlife[26]

56. The pygmy-owl is listed as one of the 116 animals considered to be Wildlife Species of Special Concern by the Department. Specific goals for the pygmy-owl include habitat conservation and restoration through improved agricultural and fire management practices, mitigated effects of urbanization, decreased habitat fragmentation, and restoration of movement corridors.[27]

57. The pygmy-owl is state-listed as Wildlife of Special Concern. During the section 7 consultation process, the Department can serve as a technical advisor by providing biological information on the pygmy-owl to both the Service and the project proponent. While the Service is solely responsible for determining the acceptability of a project proposal during the section 7 process, Action agencies and third parties often discuss potential changes to projects that benefit Wildlife Species of Special Concern with the Department prior to the section 7 consultation process. These changes are incorporated into the consultation process if the Service deems them beneficial to the pygmy-owl.[28] This analysis assumes that all costs resulting from future consultations are fully attributable to section 7 of the Act.

**Arizona Preserve Initiative: "Growing Smarter"**

58. The Arizona Preserve Initiative (API) was passed by the Arizona State Legislature in 1996 with the aim of preserving select portions of State Trust Land in the vicinity of urban areas experiencing high growth. State Trust Land within incorporated cities and towns, within one mile of incorporated municipalities of less than 10,000 persons, or within three miles of municipalities equal to or greater than 10,000 persons may be reclassified for conservation purposes. Conservation can occur through permanent acquisitions of land or temporary acquisitions of lands with leases of up to 50 years. Amendments to the API provided for a public-private matching grant program, known as "Growing Smarter" grants. These grants, administered by the Arizona State Parks Board and funded by the State Land Conservation Fund, provide funding to individual landowners and livestock grazing or agricultural leaseholders of state and Federal land who commit to conservation-based

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[26] Personal Communication with Habitat Specialist, Arizona Game & Fish Department, August 14, 2002.

[27] Species in the Arizona Heritage Data Management System, Updated January 01, 2002. http://www.gf.state.az.us/frames/fishwild/hdms_site/Species%20Lists/1Status%20Definitions.htm.

[28] Personal Communication with Habitat Specialist, Arizona Game & Fish Department, August 14, 2002.

management alternatives that reduce livestock or crop production and provide wildlife habitat and preserve open space.[29]

59. The State Land Department has reclassified over 600,000 acres of State Trust Land to be eligible for conservation uses under the API.[30] In 1997, amendments to the API extended the applicable areas to Pima County and lands in Pinal County, particularly the Tortolita Foothills. Both Pima and Pinal Counties have filed an application to acquire land in the Tortolita Mountain Park Addition and approximately 4,334 acres in a proposed Tortolita east biological corridor. While the Tortolita Mountain Park is not included in the proposed critical habitat, the Tortolita Mountain Range extends into Marana in Unit 3. The Tortolita Foothills are currently home to the second largest known pygmy-owl population in Arizona.[31]

### 2.2.3 County and City Comprehensive Plans

**Pima County: Sonoran Desert Conservation Plan**

60. Adopted in 1992 and revised in 2001, Pima County's Comprehensive Land Use Plan includes an environmental planning element called the Sonoran Desert Conservation Plan (SDCP). The SDCP, in development since 1998, is a natural resource protection strategy. The Pima County Board of Supervisors approved the SDCP in 2001. The goal of the SDCP is to ensure the long-term survival of species indigenous to Pima County through "maintaining or improving the habitat conditions and ecosystem functions necessary for survival".[32] Specifically, the plan will provide measures to minimize and mitigate the effects of activities affecting 55 Federally listed and sensitive species and the habitats upon which these species depend. The plan envisions the expansion of Pima County's mountain parks with links through biological corridors. These efforts will require large land acquisitions; the SDCP has estimated that 85,700 acres of land (51,800 Federal and 18,600 private) will be required.[33] The County intends to pursue an incidental take permit, pursuant to section

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[29] Defenders of Wildlife, http://www.defenders.org/states/wildlines/issue46.html, June 18, 2001.

[30] Arizona State Parks, Growing Smarter Grants, http://www.pr.state.az.us/partnerships/growingsmarter/growing.html. Arizona Preserve Initiative and Growing Smarter Grants, 2/22/01, Arizona Preserve Initiative (API) Project Status Report, July 19, 2002.

[31] Growing Smarter Grants may reduce costs to developers who have to mitigate during the Section 7 process. Towns may also require developers to purchase mitigation lands.

[32] Listed Species Reserve Analysis, Sonoran Desert Conservation Plan, Pima County Board of Supervisors, 2002, p. 6.

[33] *Exploring Environmental Values and Policy in the United States: Case Studies in Arizona an Louisiana*, The Bureau of Applied Research in Anthropology, University of Arizona, Tucson,

10(a)(1)(B) of the ESA, which will be a subset of the SDCP. An application is expected in Spring 2003.[34]

61. The SDCP has listed the pygmy-owl as a "priority vulnerable species", as the pygmy-owl's prime habitat covers the county's most rapidly growing residential areas. Once lands are identified and protected under the conservation program, elements of the SDCP, such as mountain park expansion, will benefit pygmy-owls in the Tortolita Mountains. Other goals, such as ranch conservation and habitat, biological, and ecological corridor preservation will also play a vital role in protecting pygmy-owl habitat.

62. In 1999, the County Board of Supervisors for Pima County initiated actions aimed at pygmy-owl protection. The Board authorized funds to conduct surveys and established a plan to eventually identify lands to be set aside for owl protection. In 2001, the Board passed guidelines to protect a 1.2 million acre biological preserve that includes most of Pima County's mountain ranges.[35] Currently, the Board notifies owners of property within the former designation of critical habitat for the owl who apply for a permit under existing zoning of the potential for owl take on their land. This notification generally prompts owners to seek either technical assistance from, or an informal or formal consultation with, the Service. For areas deemed as highest biological priority, the plan recommends an 80/20 guideline for land use, or a retention of open space at a minimum of 80 percent of its current level.[36] According to Pima County, the 80 percent guideline reflects a need to design for habitat linkages as one of the highest priorities of attaining actual conservation during rezoning site planning.[37] Implementation of this part of the plan may provide significant protection to pygmy-owl habitat if it is carried out.

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Arizona, September 2001, p. 43

[34] Listed Species Reserve Analysis, SDCP, p. 6.

[35] *Exploring Environmental Values and Policy in the United States: Case Studies in Arizona and Louisiana*, p. 44.

[36] Sonoran Desert Conservation Plan, Listed Species Reserve Analysis, 2002 and Personal Communication with Personnel, Pima County, August 18, 2002.

[37] Personal Communication with Personnel, Pima County, August 18, 2002.

**Pinal County Comprehensive Plan**

63. Pinal County's Comprehensive Plan encourages the protection and preservation of existing habitat areas for threatened or endangered plant and wildlife species, including the pygmy-owl. The plan aims to conserve scarce resources and build communities based on well-protected environmental resources. Pinal County's land use plan focuses on protecting the natural environment, including scenic views, wildlife corridors, native vegetation and natural and cultural resources. The county also promotes the protection and preservation of existing habitat for wildlife through preserving natural desert landscapes, wilderness areas, and encouraging the use of clustered development in order to preserve open spaces and maintain rural areas. The plan encourages low intensity land uses for areas around federally-owned lands including Resource Conservation Areas and encourages the Arizona State Land Department and the BLM to keep environmental concerns in mind in the management of their land holdings.[38] While the Pinal County Plan provides encouragement for maintenance of wildlife habitat, it is unclear whether the pygmy-owl receives significant baseline protection as a result of this plan.

**Marana Comprehensive Plan**

64. The City of Marana's Comprehensive Plan was developed in 1997 in response to concerns that rapid growth would sacrifice Marana's rural agricultural character. Conservation goals include preserving open spaces by limiting development in areas that represent sensitive natural habitat and introducing standards that encourage preservation of natural resources. The land use section of this plan provides for pygmy-owl habitat mitigation areas, such as off-site banks available for lease/purchase by developers and managed according the Service's standards. It also provides for on-site mitigation for portions of State Trust lands to be developed.[39] In June 2002, Marana dedicated the 2,400 acre Tortolita Preserve Nature Park which mitigates effects to the pygmy-owl from the Dove Mountain development project. The Nature Park is within the critical habitat boundaries of Unit 3.

[38] Pinal County, *Pinal County Comprehensive Plan*, adopted January 19, 2002, p. 31.

[39] Town of Marana, *Marana General Plan*, adopted February 4, 1997, p. 14.

## ECONOMIC IMPACTS OF CRITICAL HABITAT DESIGNATION ON DEVELOPMENT SECTION 3

65. The previous two sections introduced the geographic areas in which the Service is proposing to designate critical habitat for the pygmy-owl; the socioeconomic profile of these areas; general trends associated with population, economic and urban growth; and relevant pre-existing policies that affect land uses in the region. This section and the next will identify current land uses within and/or affecting the proposed critical habitat designation as well as the location, nature, and extent of future activities that may be affected by section 7 implementation.

66. This section focuses on the potential impacts of critical habitat designation for the pygmy-owl on future development activity for several reasons. First, over 20 percent of past consultations on the pygmy-owl have focused on residential development projects.[40] Of these consultations, the consultation history shows that since the species was listed as endangered, 56 percent of formal consultations on residential development were initiated during the two-year designation of critical habitat for the pygmy-owl, while the remaining 44 percent occurred prior to the previous critical habitat designation or were completed after the remand. Further, when the previous designation was vacated, several ongoing consultations were halted, indicating that the designation may have had an impact on the rate of consultation on development activity for this species.[41] Thus, this analysis estimates that the same pattern of consultations will occur in the future: 56 percent of future residential development consultations would not have occurred absent critical habitat designation. Whether the pygmy-owl critical habitat designation has, or is likely to have, a major effect on residential

[40] Note that consultations on all other activities are discussed in Section 4 of this document.

[41] However, a recent complaint filed by Defenders of Wildlife and the Center for Biological Diversity (April, 2002) may compel the ACOE and EPA to consult more regularly on development activities in areas that may contain pygmy-owls, even absent critical habitat designation. Thus, the difference implied by these scenarios may be less distinct in the future. This analysis assumes that these Action agencies will continue with their present behavior for the duration of the modeled time period.

development has been the subject of many public comments, newspaper articles, and studies.[42]

67. Importantly, consultation estimates presented in this section include all future section 7-related consultations on development associated with the proposed critical habitat area for the pygmy-owl. As such, this analysis does not attempt to distinguish impacts that may be attributable co-extensively to the listing of the pygmy-owl (See Section 5 for a discussion of this distinction). Therefore, the estimates presented in this section reflect the upper-bound of impacts potentially resulting from the proposed designation of critical habitat for the pygmy-owl.

## 3.1 Background on Development Activity Within Proposed Pygmy-owl Critical Habitat

68. Rapid growth characterizes recent development activity in Pima County, particularly in the areas northwest of Tucson (which includes Units 2 and 3). Between 1990 and 2000, the number of housing units sold annually in Tucson nearly doubled. Pima County's Comprehensive plan assumes that the population of eastern Pima County will increase by approximately 330,000 people (38.4 percent) over the next decade.[43] At an average of 2.5 people per residence, this growth would require the construction of more than 130,000 new residences.[44] Growth projections indicate that in areas such as Marana, the periods of greatest growth still lie ahead. Marana anticipates producing 7,000-8,000 new housing units, including retirement communities, resort-related housing, and single/multifamily homes, in the next twenty years. Several major development projects and planned communities, such as Dove Mountain and Continental Ranch, represent significant growth areas. The city

[42] Examples include: Morlock, Blake "Owl lots at a premium: Northwest Side Buyers Figure Bird Protections Will Keep Area Open," *Tucson Citizen*, Dec 4, 2001; "Owl Plan Will Cost Tucson Area $8.5 Billion, Home Builders Say," *The Arizona Daily Star*, March 10, 1999; Elliott D. Pollack and Company, "The Economic and Fiscal Impact of the Designation of 60,060 Acres of Privately Owned Land in Pima County, Arizona as Critical Habitat for the Cactus Ferruginous pygmy-owl," prepared for Southern Arizona Homebuilders Association, February 25, 1999; Bruce McKenney, "Economic Activity Following Critical Habitat Designation For the Cactus Ferruginous Pygmy-owl, A Review of Key Economic Indicators", Prepared for The Coalition for Sonoran Desert Protection, October 2000.

[43] Pima County Comprehensive Plan Update, Pima County Board of Governors, December 18, 2001. Note that past residential development has occurred at lower than expected densities, contributing to sprawl. The County Comprehensive Plan is designed, in part, to slow sprawl in the future.

[44] This is slightly lower than the national average of 2.61 persons per residence. Accessed at http://eire.census.gov.popest/archives/household/sthuhh1.txt on August 26, 2002.

predicts that by 2010 over seventeen square miles of currently undeveloped land may be developed.

69. Projections for other critical habitat areas do not anticipate as much development pressure as in the northwest Tucson area. For example, unofficial population estimates and projections for Pima County census tracts show that western Pima County (including Unit 5) had negligible population growth for the years 1990-2000, and will receive approximately 0.1 percent of expected population growth for the county over the next 50 years. Similarly, the census tract containing Unit 1 of proposed critical habitat (south central Pima County), may experience population growth of only four percent over the next 50 years.[45]

## 3.2 Projected Number of Housing Units Within the Proposed Pygmy-owl Critical Habitat Designation

70. To estimate the future impacts of pygmy-owl critical habitat designation on future residential housing development, this analysis first estimates the number of housing units presently anticipated to be built in critical habitat areas. To accomplish this task, a geographic information system (GIS) model created by the Pima Association of Governments was employed that projects future population and housing units in Eastern Pima County for the year 2030.[46] This model was peer reviewed by the local jurisdictions included with it, and has been approved by the County Population Planning Committee. The model is regularly used by county and local transportation planners. This model utilizes "a 'bottom-up' approach by reviewing land capability and policy guidance at the parcel level" and relies on approved development and recently adopted general plans from local areas.[47] The model also relies on the Pima County Comprehensive Plan, and assumes it will be implemented as written. The model projects the number of housing units by Transportation Analysis Zone (TAZ) polygons, which are typically subsets of census tracts or block groups. A GIS map of the proposed pygmy-owl critical habitat area was then overlayed on these TAZ polygons, and the number of housing units anticipated to occur within the boundaries of proposed critical habitat was determined.

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[45] "Population estimates and projections: Pima County Census Tracts", Tucson Planning Department, accessed at http://www.ci.tucson.az.us/planning/trctproj.pdf on August 28, 2002.

[46] Pima Association of Governments, Population and Housing Model, Version 1 (August 8, 2002).

[47] Written communication with Pima Association of Governments, August 8, 2002; personal communication with Planner, Pima Association of Governments, October 9,2002.

71. Using this method, the model predicts that 14,935 units will be built in pygmy-owl critical habitat by 2030, or approximately 500 units per year.[48] This figure represents approximately five percent of the housing growth projected in Eastern Pima County (274,760 units by 2030, or approximately 9,159 units per year).

72. As expected within the proposed critical habitat, most of the development that is anticipated will occur in northwestern Tucson, particularly Unit 3. Exhibit 3-1 presents the number of projected housing units on a unit-by-unit basis.

**Exhibit 3-1**

**PROJECTED ANNUAL NUMBER OF NEW HOUSING UNITS IN PYGMY OWL CRITICAL HABITAT (BY 2030)**

| Unit | Annual New Housing Units | Percent of Total |
|---|---|---|
| Unit 1 | 37 | 7.4 % |
| Unit 2 | 168 | 33.7% |
| Unit 3 | 191 | 38.3 % |
| Unit 4[a] | 103 | 20.6 % |
| Unit 5[b] | n/a | n/a |
| **Total** | **499** | **100 %** |

[a] The PAG model doe not include Pinal County, where Unit 4 occurs. However, due to the proximity of Unit 4 to Unit 3, this analysis assumes that the rate of development will be equal for both areas. Thus, the ratio of Unit 4 area to Unit 3 area was multiplied by the housing estimates for Unit 3 to determine Unit 4 estimates. Public comments that provide better insights into development patterns in this portion of southern Pinal County are welcomed.

[b]The PAG model does not include western Pima County. However unofficial population estimates and projections for Pima County census tracts show western Pima County (including Unit 5) had negligible population growth for the years 1990-2000, and will receive only 0.1 percent of expected population growth for the county over the next 50 years.

Notes: To arrive at unit level housing estimates, this analysis assumes that development within a TAZ will be distributed equally. Thus, to account for the irregular shapes of the TAZ and critical habitat polygons, TAZ housing projections for zones that fell partially within the boundaries of the proposed critical habitat were multiplied by the ratio of the amount of land falling in versus out of the zone.

Source: Pima Association of Governments, Population and Housing Model, Version 1 (August 8, 2002).

[48] This estimate assumes that development within a TAZ will be distributed equally. Thus, to account for the irregular shapes of the TAZ and critical habitat polygons, TAZ housing projections for zones that fell partially within the boundaries of the proposed critical habitat were multiplied by the ratio of the amount of land falling in versus out of the zone.

## 3.3 History of Consultation on Residential/Commercial Development

73. To estimate the number and character of future section 7 consultations for this species, this analysis relies on the consultation history for the pygmy-owl. There have been at least eleven formal consultations regarding the pygmy-owl that involved private development over the past five years. The Action agencies for these consultations were the Environmental Protection Agency and/or the Army Corps of Engineers. The projects under consultation have varied by type of development, size and scope, and the consultations have varied in length and complexity. Exhibit 3-2 presents a summary of key characteristics of these consultations.

**Exhibit 3-2**

**SUMMARY OF KEY CHARACTERISTICS OF CONSULTATIONS ON DEVELOPMENT**

| | |
|---|---|
| Involved Action Agencies | ACOE, EPA |
| Types of development | Single/Multi-family homes, apartments, golf courses, commercial enterprises, utilities |
| Acres developed per project | 2.17 to 1,424. Average: 194 |
| Number of housing units per project | 10 to 1600. Average: 375[a] |
| Length of consultation process | 5 months to 3.25 years. Average: 1.5 years |

Source: Formal biological opinions on the pygmy-owl, accessed at http://arizonaes.fws.gov/biologic.htm and through the administrative record for these consultations maintained in the Phoenix, AZ Ecological Services Office.

[a] To create an upper bound estimate of consultation numbers, and to reflect a range more typical of Northwest Tucson area developments, a range of 150 to 375 units per development was used in this analysis.

74. In many areas of the United States, ACOE permitting under section 404 of the Clean Water Act constitutes the primary Federal nexus for consultation regarding private development. Under this program, the ACOE issues permits for private activities that involve modifying navigable waterways and/or wetlands for construction and maintenance of structures.[49] However, ACOE has been involved in just five out of nine past consultations on the pygmy-owl and residential development, and was the lead Action Agency on only one of these consultations.

[49] ACOE issues four types of permits: (1) individual permit, a type of standard permit requiring public comment; (2) letter of permission (LOP), a type of standard permit requiring coordination with adjacent property owners; (3) nationwide permits, which authorize a category of activities and are issued for individual small projects across the United States; and (4) regional or general permits, which authorize a category of activities in a specific region.

75. EPA's National Pollutant Discharge Elimination System (NPDES) permit program regulates point source pollution into the waters of the United States. EPA's Phase II NPDES Storm Water Program (published December 8, 1999), requires permit coverage for storm water discharges from "construction activity disturbing between 1 and 5 acres of land (i.e. small construction activities)."[50] Because Arizona does not have an approved state NPDES permit program, [51]EPA has historically been involved directly in consultations on the pygmy-owl for NPDES-related activities. In past consultations on development, EPA has frequently taken the role as lead Action Agency.

## 3.4 Projected Number of Consultations on Development Over the Next Ten Years

76. Past consultations involved developments that averaged 375 units.[52] Small developments, particularly those less than five acres in size, are less likely to have a Federal nexus, and thus are less likely to result in a section 7 consultation with the Service. Single home developments have not historically resulted in formal consultations on the pygmy-owl. Therefore, to generate an upper bound estimate of the likely number of future section 7 consultations on the pygmy-owl (i.e., more likely to overstate costs than understate them), this analysis assumes that all future housing units will be developed as part of large-scale development, and thus may be subject to a section 7 consultation. By assuming that an average housing development will consist of a proposal for 150 to 375 units, this analysis estimates that there will be approximately 1.3 to 3.3 consultations per year (annual number of units built/150 or 375) in pygmy-owl critical habitat, or 13 to 33 consultations over 10 years. Because this estimate assumes that every unit will be part of a large-scale development, it is likely to overestimate the number of section 7 consultations that will occur on the pygmy-owl over the next 10 years. Exhibit 3-3 presents the estimated number of future consultations by unit.

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[50] Accessed at http://cfpub.epa.gov/npdes/stormwater/swphase2.cfm?program_id=6 on August 30, 2002.

[51] Accessed at http://cfpub2.epa.gov/npdes/statestats.cfm?program_id=45&view=specific on August 30, 2002.

[52] To create an upper bound estimate of consultation numbers, a range of 150 to 375 units per development was used in this analysis.

**Exhibit 3-3**

**UPPER-BOUND ESTIMATE OF FORMAL CONSULTATIONS BETWEEN THE SERVICE AND EPA/ACOE ASSOCIATED WITH RESIDENTIAL DEVELOPMENT AFFECTING PROPOSED CRITICAL HABITAT FOR THE PYGMY-OWL (TEN YEARS)**

| Unit | Projected number of Housing Units (over 10 years) | Number of Formal Consultations (over 10 years) |
|---|---|---|
| 1 | 370 | 1 to 2 |
| 2 | 1,680 | 4 to 11 |
| 3 | 1,910 | 5 to 13 |
| 4 | 1,030 | 3 to 7 |
| 5 | n/a | 0 |
| **TOTAL CONSULTATIONS ON DEVELOPMENT** | | **13 to 33** |

Sources: Personal communications with Service biologists, relevant Federal agencies, review of past Biological Opinions, and PAG model, 2002.
*The PAG model does not include western Pima County. However, unofficial population estimates and projections for Pima County census tracts show western Pima County (including Unit 5) had negligible population growth for the years 1990-2000, and will receive approximately 0.1 percent of expected population growth for the county over the next 50 years.

77. Formal consultations on housing developments have typically generated significant project modifications, including construction delays, on-site mitigation, off-site mitigation, habitat restoration and enhancement, revegetation, minimization of noise disturbance and conducting pygmy-owl studies. See Section 5 for estimates of the potential costs of these measures.

## ECONOMIC IMPACTS OF CRITICAL HABITAT DESIGNATION ON OTHER LAND USE ACTIVITIES SECTION 4

78. This section identifies non development-related land use within and/or affecting the proposed critical habitat designation for the pygmy-owl, including the location, nature, and extent of future activities that may be affected by section 7 implementation. This section organizes potential impacts by land use and then by unit, and finishes by summarizing estimates of consultations and other impacts on activities affecting the critical habitat designation.

79. Numerous Action agencies carry out and permit activities and projects in or adjacent to proposed critical habitat areas. These activities may lead to section 7 consultations with the Service, and in some cases specific projects may be modified in order to protect the pygmy-owl and/or its habitat. The primary non-development related activities that may be affected by section 7 implementation of critical habitat designation are livestock grazing, ranching, and mining. Livestock grazing and ranching activities often have a Federal nexus with the BLM and the Forest Service while mining activities have a Federal nexus with the BLM and the EPA. Other activities conducted by the Immigration and Naturalization Service and national parks, national monuments, and wildlife refuges may also result in section 7 consultation with the Service. In addition, construction activities involving roads and flood control structures may lead the Service to consult with the Federal Highway Administration (along with Arizona's Department of Transportation) or the EPA. Finally, construction of utility corridors, municipal facilities, and flood control structures may result in consultations with the Department of Energy, BLM, the Forest Service, and Federal Emergency Management Agency.

80. Based on past biological opinions, which include few project modifications or conservation recommendations for non-development related activities, this analysis assumes that these activities will be minimally impacted by the designation of critical habitat for the pygmy-owl.

## 4.1 Livestock Grazing and Ranching

81. Ranches in Arizona are predominantly dependent on state or Federal livestock grazing permits administered by the U.S. Forest Service, the BLM, and the Arizona State Land Department (ASLD). In fact, state and Federal livestock grazing permits and leases account for over 85 percent of the state's grazing land outside of Indian lands.[53] In the past five years, there have been 14 formal consultations on livestock grazing activities and the pygmy-owl. Of the 14 consultations, 13 were initiated by the BLM. The BLM has addressed the majority of allotments within all units proposed as critical habitat for the pygmy-owl in two programmatic Biological Opinions; the Safford/Tucson Livestock Grazing Program and the Five Livestock Grazing Allotments in the Vicinity of Ajo. The Service recognizes the negative impacts of livestock grazing on federally listed species but has stated in several biological opinions that there is no information to indicate that livestock grazing adversely affects the pygmy-owl.[54] Formal consultations have typically required annual surveys for the occurrence of pygmy-owls, fencing, monitoring, and reductions in utilization rates. The Service expects no change in project modifications as a result of designating critical habitat for the pygmy-owl.[55] Based on past biological opinions and Service and BLM projections, this analysis anticipates a total of two formal section 7 consultations on livestock grazing activities within the proposed critical habitat boundaries in the next ten years both of which will be reinitiations of previous programmatic consultations.

82. The Programmatic Safford/Tucson Livestock Grazing Program Biological Opinion addressed most of the BLM allotments within the proposed critical habitat boundaries in Units 1, 2, 3, and 4. This programmatic consultation will most likely be reinitiated following the designation of critical habitat for the pygmy-owl. This analysis therefore anticipates one formal consultation in the future that will collectively address allotments in Units 1 through 4.[56]

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[53] Questions and Answers about Ranching in Arizona, Office of Arid Land Studies, University of Arizona, http://ag.arizona.edu/OALS/agnic/azranching.html, 15 July 1997.

[54] For example, see Biological Opinion for Livestock Grazing, Conley Beloat Allotments, December 5, 2001, Programmatic Biological Opinion for Safford/Tucson Field Offices Livestock Grazing Program Southeastern Arizona Reinitiation/Amendment, December 4, 2001.

[55] Personal Communication with Biologist, Tucson Ecological Field Services Office July 31, 2002.

[56] As the Programmatic Safford/Tucson consultation addressed livestock grazing activity in four units, this analysis distributes the costs of reinitiating the consultation amongst all four units.

### 4.1.1 Unit 1

83. The area north and west of the Buenos Aires Wildlife Refuge in Unit 1 is known as Altar Valley. Most of the land in this area is leased out for cattle ranching and owned by the ASLD, with few private landowners and BLM holding parcels. The Safford/Tucson Livestock Grazing Program Biological Opinion addressed BLM's issuance of 10-year permits on allotments within Unit 1, and the allotments will be addressed again in the reinitiation. The Service has not consulted on any livestock grazing on State lease lands and does not anticipate consulting on ASLD land in the next ten years as there is not likely to be a Federal nexus.[57]

### 4.1.2 Unit 2

84. Unit 2 contains numerous livestock grazing allotments within the Ironwood Forest National Monument. These allotments were addressed in the Safford/Tucson Livestock grazing and Program Biological Opinion and, as mentioned above, will be readdressed when the consultation is reinitiated. The allotments will also be addressed in a formal consultation on the forthcoming resource management plan for Ironwood Forest National Monument. Once critical habitat has been designated for the pygmy-owl, this consultation on the Monument management plan, if completed prior to the designation, is likely to be reinitiated. As a biological opinion will be issued regarding all Monument activities, this consultation is addressed below in Section 4.4: Parks, National Monuments, and Wildlife Refuges.

### 4.1.3 Units 3 and 4

85. As mentioned above, allotments in Units 3 and 4 were addressed in the Safford/Tucscon Livestock Grazing Program Biological Opinion and are likely to be addressed in the consultation reinitiation.

### 4.1.4 Unit 5

86. The vast majority of the land located between the Barry Goldwater Bombing Range, Tohono O'Odham Nation, Organ Pipe Cactus National Monument, and Cabeza Prieta National Wildlife Refuge is owned by the BLM, and is referred to as the "Ajo Block". The Ajo Block contains approximately ten townships, with land primarily used for livestock grazing.[58] The Service has recently completed a Biological Opinion for the Ajo Allotments which addressed a majority of the allotments within the Unit 5. As this consultation will be reinitiated following designation of critical habitat for the pygmy-owl, this analysis

[57] Personal Communication with Biologist, Tucson Ecological Services Field Office, October 2002.

[58] Personal communication with Staff Biologist, BLM Phoenix Office, June 14, 2002.

anticipates one formal consultation on livestock grazing within Unit 5.[59] This area was also addressed in the Lower Gila Resource Management Plan.

## 4.2 Mining

87. Arizona leads the nation in copper production, accounting for 65 percent of total U.S. mine production.[60] Historically, there have been two formal consultations regarding the impact of mining activities on the pygmy-owl. In one consultation, the BLM conducted a land exchange with ASARCO Inc. who sought to acquire land for its Ray copper mine. The Service determined that the land exchange was not likely to jeopardize the continued existence of the pygmy-owl or result in destruction or adverse modification of its habitat. In the other consultation, the EPA consulted with the Service regarding Pima County's plans to construct a sand and gravel operation on land leased from ASARCO. Recommendations included monitoring for pygmy-owls and if detected, halting operations until authorized by the Service.

88. In general, the Service has determined that mining activities, such as open-pit craters and tailing piles are incompatible with the pygmy-owl's critical habitat. While mining activities in the proposed critical habitat are minimal at present, there is a potential for expansion of mining operations in the future and therefore, the potential for consultation exists. Potential modifications anticipated by the Service include the preservation of natural desert habitat of a quantity and quality that would retain habitat values for nesting and connectivity.[61] In anticipation of increased mining activity on public lands, this analysis forecasts approximately six formal consultations on mining activity in the next ten years in pygmy-owl critical habitat areas.[62]

### 4.2.1 Unit 2

89. There are several mining-related operations in proximity to Unit 2. El Grupo/Grupo Mexico operates the Silverbell Mine. This operation is adjacent to the Ironwood Forest National Monument. These facilities are not currently in operation, and El Grupo is

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[59] Personal communication with BLM Tucson Office, September 2002; Personal communication with Tucson Ecological Services Field Office, October 2002.

[60] Arizona Mining Association Web Site, Copper Mining, http://www.azcu.org/azcumining/index.html, December 18, 2000, Accessed on August 9, 2002.

[61] Personal communication with Biologist, Tucson Ecological Services Field Office, August 22, 2002.

[62] Ibid., August 1, 2002.

considering relocating operations.[63] However, the existence of these facilities presents the potential for future expansion of mining operations onto BLM lands in the Unit. This analysis assumes that two of the consultations anticipated in the next ten years will involve mining activities in Unit 3.

### 4.2.2 Unit 4

90. There are several smaller mining operations in Pinal County on BLM lands, but current activities at these operations are in initial stages and do not yet warrant consultation. Two projects have initiated informal consultations and both are approximately 100 acres in size. The Service anticipates that mining operations in Pinal County will expand in the next ten years and may result in formal consultations. The Service does not expect extensive conservation recommendations and project modifications as mining operations in Pinal County are located in less developed areas. Thus, this analysis assumes that two of the six consultations on mining operations will occur in Pinal County.[64]

### 4.2.3 Unit 5

91. Unit 5 does not include any areas currently used for mining. Phelps Dodge Corporation owns the nearby Ajo Mines but they are no longer operational. The Service has determined that areas adjacent to and within the Ajo Mines do not contain the primary constituent elements for the pygmy-owl and have therefore excluded these mines from proposed critical habitat. However, there are numerous mining claims on BLM lands in Unit 5 and if operations are initiated in the next ten years, consultation will be likely.[65] This analysis therefore assumes that there will be two future consultations on mining activities in Unit 5.

## 4.3 Immigration and Naturalization Service

92. As a Federal agency, the Immigration and Naturalization Service (INS) is required to consult with the Service regarding the environmental impact of their Border Patrol activities, whenever these activities are expected to affect a listed species. The INS's Tucson Sector administers activities within the boundaries of the proposed critical habitat for the pygmy-owl. While to date there has been no formal consultation with the Service on INS activities,

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[63] Ibid., August 12, 2002.

[64] Ibid.

[65] Written communication with Biologist, Tucson Ecological Services Field Office, October 2002.

the Tucson Sector is currently conducting a biological assessment to initiate section 7 consultation on their on-going and proposed activities. In a past consultation in the Yuma Sector regarding the Sonoran pronghorn antelope, the Service concurred with a biological assessment that determined that the Border Patrol's activities would not likely adversely affect the pygmy-owl.[66] Based on the consultation history and interviews with the Service, this analysis conservatively (i.e., more likely to overstate impacts than understate them) assumes that there will be five formal consultations on INS activities and the pygmy-owl over the next ten years.

### 4.3.1 Unit 1

93. Unit 1 extends to the U.S.-Mexico border. Ongoing INS activities such as off-road vehicle use, fence construction, and border patrolling may impact critical habitat areas. The construction of fences primarily occurs near towns, and is discouraged in open space. This analysis assumes that two of the five anticipated formal consultations with INS will be initiated regarding Border Patrol activities in Unit 1 in the next ten years.

### 4.3.2 Unit 2

94. Unit 2 is also experiencing considerable border crossing activities and impacts. This analysis assume that one formal consultation will be initiated regarding INS activity in Unit 2 in the next ten years.

### 4.3.3 Unit 5

95. Unit 5 also extends to the U.S.-Mexico border. INS activities such as border patrolling and off-road operations have affected the terrain around Ajo and the Organ Pipe Cactus National Monument. This analysis assumes that two formal consultations will be initiated by the INS in Unit 5 over the next ten years.

## 4.4 Parks, National Monuments and Wildlife Refuges

96. Past pygmy-owl consultations regarding activities in national and state parks, national monuments and wildlife refuges have been initiated by the National Park Service, BLM, and the Service's division of National Wildlife Refuges. Projects for which consultations have occurred include fire plans, trailwork plans, and general management plans. Project modifications for consultations have included conducting annual surveys, promoting visitor awareness, and limiting utilization rates (i.e. management of visitation in sensitive areas). Historically there have been five consultations on the pygmy-owl in the past five years. Based on information provided by parks, national monuments, and wildlife refuges within the

[66] Biological and Conference Opinion for United States Border Patrol Activities in the Yuma Sector, Wellton Station, Yuma Arizona, U.S. Border Patrol, September 5, 2000.

proposed critical habitat for the pygmy-owl, this analysis assumes that there will be 22 formal consultations on projects involving these land uses in the next ten years.

### 4.4.1 Unit 1

97. **Buenos Aires National Wildlife Refuge.** Buenos Aires National Wildlife Refuge is located in Unit 1 of the designation. The Service established the Refuge in 1985 to protect and restore a grassland ecosystem for endangered and native wildlife in western Pima County.[67] Buenos Aires National Wildlife Refuge uses controlled burning of approximately 20,000 acres per year to restore native grasslands, which helps slow mesquite invasion and revitalize the soil. The Refuge has recently completed a consultation with the Service on its Fire Management Program. Project modifications included the cancellation of a burn upon detection of a pygmy-owl.[68] The Refuge anticipates that it will consult annually with the Service on its fire management plan. In addition, the Service recently completed a consultation on the Buenos Aires National Wildlife Refuge Comprehensive Conservation Plan. This consultation will be reinitiated following designation of critical habitat for the pygmy-owl. The Service also anticipates consulting at least once on additional Refuge infrastructure activities. Thus, this analysis anticipates 12 formal consultations with the Service within Buenos Aires National Wildlife Refuge in the next ten years.[69]

### 4.4.2 Unit 2

98. **Ironwood Forest National Monument.** The majority of land in the Ironwood Forest National Monument, a 128,917 acre parcel, is owned by the BLM and is included in Unit 2. The Arizona State Land Department and private landowners also own portions of this land. On June 6, 2000 the area was declared a National Monument by President Clinton, to protect the area's biological and cultural resources. As a result, all Federal lands and interest in lands within the boundaries of this monument are withdrawn from all forms of entry, location, selection, sale, or leasing under public land laws.[70] Other restrictions include the prohibition of new mining claims or geothermal leasing, and off highway vehicle use.[71] BLM does not

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[67] U.S. Fish and Wildlife Service, "Buenos Aires National Wildlife Refuge," http://ifw2irm2.irm1.r2.fws.gov/refuges/arizona/buenos.html, as viewed on June 12, 2002.

[68] Personal Communication with Manager, Buenos Aires National Wildlife Refuge, August 22, 2002.

[69] Written communication with Biologist, Tucson Ecological Services Field Office, October 2002.

[70] Arizona Bureau of Land Management, "Ironwood Forest National Monument," http://www.az.blm.gov/ironwood/ironwood.htm, Accessed on June 7, 2002.

[71] Arizona Bureau of Land Management, "Ironwood Forest National Monument Fact Sheet." http://www.az.blm.gov/ironwood/ironwoodfctsht.htm, Accessed on July 25, 2002.

plan to sell their lands in this area and is attempting to acquire additional lands from the state of Arizona and private individuals. Presently, most of this land is used for livestock grazing, hunting, and target shooting.[72] The BLM does not anticipate future consultations with the Service regarding these activities.[73] However, Ironwood Forest National Monument is currently developing a resource management plan. The Service anticipates one formal consultation with the BLM on this resource management plan.[74] If this consultation is completed prior to the designation, the consultation will be reinitiated following designation of critical habitat for the pygmy-owl. Conservatively, this analysis anticipates a total of two consultations regarding Ironwood Forest activities in the next ten years.

99. **Saguaro National Park West.** Saguaro National Park West, also referred to as the Tucson Mountain District of the park, is located in Unit 2. This 91,445 acre portion of the Sonoran Desert, home to the saguaro cactus, was designated as Saguaro National Park in 1994. Because this land is used exclusively for recreation (mainly hiking), it is unlikely that these activities will result in consultations. The park's policy is to monitor for endangered species and the park has conducted several surveys for the pygmy-owl resulting in one confirmed sighting. Park staff indicate that current and planned activities at the park, such as development of a Trails Plan, are not expected to result in formal consultations with the Service.[75]

100. **Tucson Mountain Park.** Unit 2 also contains most of Tucson Mountain Park, owned and operated by the Pima County Natural Resources, Parks and Recreation Department. Presently this land provides recreational opportunities in the form of an archery range, firing range, horseback riding and bicycling trails, picnic and camping areas. While the Service has provided technical assistance to Pima County Parks Department regarding their development of recreation facilities in Unit 2, the Service anticipates that activities within the park are unlikely to result in formal consultations involving the pygmy-owl.[76]

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[72] Personal Communication with Staff, Tucson Office of BLM, June 10, 2002.

[73] Personal Communication with Staff, Tucson Office of BLM, August 20, 2002.

[74]Written communication with Biologist, Tucson Ecological Services Field Office, October 2002.

[75] Personal Communication with Biologist, Saguaro National Park West, August 20, 2002.

[76]Written communication with Biologist, Tucson Ecological Services Field Office, October 2002.

### 4.4.3 Unit 5

101. **Organ Pipe Cactus National Monument**. The Organ Pipe Cactus National Monument includes 330,700 acres of Sonoran Desert in western Pima County that are home to over 25 varieties of cactus, including the organ pipe and saguaro cacti. The area has been a national monument since 1937 and was declared a Biosphere Reserve in 1976. Presently this land is used for recreation, mainly hiking and camping. The Service has consulted with Organ Pipe on its Comprehensive Management Plan and on modifications to Puerto Blanco Road. The Service anticipates consulting with Organ Pipe regarding construction modifications to State Route (SR) 85 as well as additional infrastructure activities. Based on Service projections, five formal consultations on Organ Pipe activities are anticipated in the next decade.[77]

102. **Cabeza Prieta National Wildlife Refuge**. Part of the Cabeza Prieta National Wildlife Refuge is located within Unit 5 of the designation. The 860,000 acre parcel has been a refuge since 1939. The Refuge conducts small activities, such as road re-paving that may result in consultation with the Service.[78] In addition, the Refuge is currently developing a comprehensive conservation plan and will consult with the Service once completed. Based on Service estimates, this analysis anticipates three formal consultations on Refuge activities within the next ten years.

## 4.5 Road Construction/Maintenance/Improvement

103. The Federal Highway Administration (FHWA) provides partial funding to state Departments of Transportation (DOTs) for road construction projects. Major road construction, maintenance, and improvement projects in areas proposed as critical habitat for the pygmy-owl are likely to require section 7 consultation. Projects that involve the construction of flood control structures and road improvements may also require permits from EPA. The primary risk to the pygmy-owl and its habitat from road construction activities are noise and vegetation disturbance and the loss of suitable habitat and connectivity. This analysis attributes section 7 consultations and project modifications associated with road construction projects to both the FHWA and EPA nexuses.

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[77]Written communication with Biologist, Tucson Ecological Services Field Office, October 2002.

[78] Personal Communication with Biologist, Cabeza Prieta National Wildlife Refuge, August 22, 2002.

104. The Service has consulted in the past on Duval Mine Road, Twin Peaks Road, and Thornydale Road regarding the pygmy-owl.[79] Project modifications have included the purchase of off-site conservation lands, actions to minimize noise and vegetation disturbance, and the monitoring of construction activities both during and after completion of the project.[80] This analysis anticipates six formal section 7 consultations regarding road construction and maintenance activities in the next ten years.

### 4.5.1 Unit 1

The Service anticipates consulting with the Arizona State DOT (ADOT) on maintenance activities on State Route (SR) 86 to the town of Sells. Consultation is likely to remain on the informal level.[81]

### 4.5.2 Unit 2

105. The Service anticipates one formal consultation with ADOT regarding the widening of Interstate 10 between Units 2 and 3 south of Avra Valley Road and through Unit 2 north of the Pima/Pinal County line. Project modifications are likely to include the purchase of off-site mitigation lands and re-vegetation.[82]

### 4.5.3 Unit 3

106. ADOT anticipates consultation with the Service on road construction projects within Unit 3. ADOT intends to widen Tangerine Road and will be likely to initiate formal consultation with the Service.[83] GIS analysis of Capitol Improvement projects in Pima County indicates that there are three construction projects located in Unit 3.[84] Two are on

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[79] Duval Mine Road and Twin Peaks Road are not within the proposed critical habitat boundaries.

[80] Biological Opinion on the Effects of the Thornydale Road Improvement Project in Pima County, Arizona, February 25, 2002, http://arizonaes.fws.gov/biologic.htm, Accessed on August 28, 2002.

[81] Personal communication with Biologist, Tucson Ecological Services Field Office, October 2002.

[82] Environmental Specialist, Arizona State Department of Transportation, August 28, 2002 and GIS analysis; Written Communication with Service, October 2002.

[83] Personal Communication with Service, October 2002, Environmental Specialist, Arizona State Department of Transportation, August 28, 2002 and GIS analysis.

[84] GIS shapefile data, "Capitol Improvement Projects; Department of Transportation," provided by Pima County Department of Transportation, August 30, 2002.

hold (Hartman Lane North of Cortaro Farms Road and Thornydale Road from Cortaro Farms to Linda Vista) and one is active (Cortaro Farms Road: 1-10 to Thornydale Road). This analysis estimates that these four projects will be consulted on in the next ten years

### 4.5.4 Unit 4

107. Park Link Drive, which connects Interstate 10 and SR 79 in Pinal County, is slated for widening. The Service anticipate that FHWA will initiate a formal consultation regarding this project.[85]

## 4.6 Utilities Construction

108. The Service anticipates consultation on utilities construction with the BLM, the Department of Energy, and the Forest Service regarding the pygmy-owl. In the past, the Rural Utilities Service has initiated one formal consultation with the Service regarding the construction of an electric power substation for the Arizona Electric Power Cooperative, Inc. The Service has also consulted with the EPA on Tucson's recharge facilities in the Avra Valley in Unit 2. The Service also consulted with BLM and AT&T regarding the construction of a fiber optic conduit from La Mesa, Texas to Los Angeles, CA. Past conservation measures have included monitoring of construction activities and habitat restoration and enhancement.[86] Based on proposed projects anticipated within pygmy-owl critical habitat areas, this analysis anticipates three consultations on utility construction activities in the next ten years.[87]

### 4.6.1 Unit 1

109. New Mexico Public Utilities proposes two alternate routes from Phoenix to Mexico, one of which traverses through Units 1 and 2.[88] Although the utilities may select the option

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[85] Written communication with Biologist, Tucson Ecological Services Field Office, October 2002.

[86] Biological Opinion for AT&T NEXGEN/CORE PROJECT, April 5, 2001 and Thornydale Substation, October 30, 2000. In the former biological opinion, the Service's reasonable and prudent measures included implementing conservation measures agreed to in project description. Conservation measures for the pygmy-owl by the BLM and AT&T included providing funding for vegetation restoration (p.23).

[87] Written communication with Biologist, Tucson Ecological Services Field Office, October 2002.

[88] Written communication with Biologist, Tucson Ecological Services Field Office, October 2002.

that does not affect pygmy-owl critical habitat areas, this analysis assumes that the project will affect critical habitat, and thus will likely result in a formal consultation with the Service.

### 4.6.2 Unit 2

110. TRICO has proposed a power-line through Saguaro NP West in Unit 2. This analysis assumes that the project will result in one formal consultation with the National Park Service in the next ten years.

### 4.6.3 Unit 3

111. There is a new power plant proposed in Unit 3 near Interstate 10 which will require a section 7 consultation with EPA. They are not proposing new transmission lines.[89]

## 4.7 Rarely Impacted Activities

112. Based on a review of past biological opinions, several additional activities were found to have generated consultations regarding potential adverse affect on the pygmy-owl. In the future, similar activities and projects may lead to section 7 consultation with the Service regarding the pygmy-owl (both formal and informal). However, because historical consultations involving these activities were infrequent and did not involve extensive project modifications, this analysis does not attempt to quantify the impacts on these Federal agencies.

- **Federal Emergency Management Agency (FEMA) Activities**. FEMA has consulted once with the Service regarding project plans for the relocation of municipal facilities in the town of Kearny, Pinal County. Activities included the construction of recreational facilities, a wastewater treatment plant, and an airport runway. The Service concurred with FEMA's biological assessment that the proposed project was not likely to adversely affect the pygmy-owl. Recommendations included transplanting saguaro cacti that would be disturbed as well as monitoring for pygmy-owls and halting activity if detected.[90]

- **Prison Construction.** The Department of Justice and the Federal Bureau of Prisons jointly initiated one consultation with the Service on the construction of a U.S.

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[89] Personal communication with Biologist, Tucson Ecological Services Field Office, October 2002.

[90] Biological Opinion for Relocation of Municipal Facilities, Town of Kearny, Pinal County, FEMA, August 17, 1998.

Penitentiary in Tucson. The Service agreed with a biological assessment that the action would not affect the pygmy-owl. The Service proposed monitoring for owls and halting construction activity if owls were detected.[91]

## 4.8 Informal Consultations

113. Service staff estimate that, in addition to the formal consultation efforts, some time is spent each year by staff biologists on informal consultations on the pygmy-owl, some of which were described above. Such informal consultations may include minor actions regarding livestock grazing, INS activities (discussed above), developments occurring outside of key habitat areas**,** prison maintenance, FEMA activities and other miscellaneous actions that may be brought to the Service's attention by any number of Federal agencies. Based on historical levels of effort on such informal consultations, this analysis estimates that approximately ten informal consultations are likely to occur on the pygmy-owl annually, or 100 informal consultations over the next ten years across all units.

## 4.9 Technical Assistance

114. In the Tucson Ecological Services Office of the Service, technical assistance for the pygmy-owl has primarily occurred in the form of phone calls made to or by the office to private parties. Most technical assistance calls have addressed how to avoid take while some address critical habitat. According to field office staff, 80-90 percent of these efforts include the mailing of a standardized letter to the interested party. The office devotes approximately 25 percent of a full-time Service Biologist's time annually to technical assistance calls for the pygmy-owl. As shown in Exhibit 4-1, the Service estimates that it handles approximately 500 technical assistance requests annually for the pygmy-owl, and expects this rate to continue in the future.[92] Thus, this analysis estimates that approximately 5,000 technical assistance efforts will take place for the pygmy-owl over the next ten years.[93]

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[91] Biological Opinion for Tucson Federal Prison, Pima County Arizona, U.S. Department of Justice, March 18, 2002

[92] Personal communication with Biologist, Tucson Ecological Services Field Office, August 6, 2002.

[93] Technical assistance efforts may not continue at a constant rate, as landowners learn about the pygmy-owl listing and critical habitat designation. To be conservative (i.e., more likely to overstate impacts than understate them) this analysis uses a constant rate of technical assistance in the future.

**Exhibit 4-1**

**UPPER-BOUND ESTIMATE OF TOTAL CONSULTATIONS AND TECHNICAL ASSISTANCE EFFORTS INVOLVING PROPOSED CRITICAL HABITAT FOR THE PYGMY-OWL (TEN YEARS)**

| Landowner or Manager | Unit | Federal Nexus | Future Formal Consultations |
|---|---|---|---|
| Livestock grazing and Ranching | 1 | BLM | 0.25 |
| | 2 | BLM | 0.25 |
| | 3 | BLM | 0.25 |
| | 4 | BLM | 0.25 |
| | 5 | BLM | 1 |
| Mining | 2 | BLM | 2 |
| | 4 | BLM | 2 |
| | 5 | BLM | 2 |
| INS | 1 | INS | 2 |
| | 2 | INS | 1 |
| | 5 | INS | 2 |
| Parks, Monuments and Refuges | 1 | FWS | 12 |
| | 2 | Park Service | 2 |
| | 5 | Park Service | 8 |
| Road Construction, Maintenance & Improvement | 2 | FHWA, EPA | 1 |
| | 3 | FHWA, EPA | 4 |
| | 4 | FHWA, EPA | 1 |
| Utilities Construction | 1 | DOE | 1 |
| | 2 | NPS | 1 |
| | 3 | EPA | 1 |
| Development (from Section 3) | 1-4 | ACOE/EPA | 13 to 33 |
| **NUMBER OF FORMAL CONSULTATIONS** | | | 57 to 77 |
| **NUMBER OF INFORMAL CONSULTATIONS** | | | 100 |
| **TECHNICAL ASSISTANCE EFFORTS** | | | 5,000 |

Sources: IEc analysis.
Note: Any potential future consultation or other impact attributable to critical habitat presumes a pre-existing Federal nexus with the Action Agency identified in the preceding column.

115. This section presents the expected total economic cost of actions taken under section 7 of the Act associated with the geographic area proposed as critical habitat for the pygmy-owl. First, this section defines the types of economic impacts likely to be associated with the proposed habitat, regardless of whether these impacts can be attributed co-extensively to other causes, such as the listing. Next, the analysis presents estimates of the number of technical assistance efforts, consultations, and project modifications that are likely to result from the designation of critical habitat for the pygmy-owl, as well as the per-unit costs of each of these activities. Based on these estimates, a total cost estimate is derived. Finally, the costs attributable solely to the designation of critical habitat are evaluated.

116. It is important to note that the listing of the pygmy-owl as endangered under the Act may have in the past, and may continue to, result in impacts on land use activities that are not associated with section 7. For example, section 9 of the Act prohibits take of an endangered species, and section 10 outlines permitting procedures for entities whose activities do not involve a Federal nexus. Economic costs associated with these impacts are not included in this analysis because they are not related to the designation of critical habitat.

## 5.1 Categories of Economic Impacts Associated with Section 7 Implementation

117. The following section provides an overview of the categories of economic impact that are likely to arise due to the implementation of section 7 in the geographic area proposed as critical habitat for the pygmy-owl.

### 5.1.1 Technical Assistance

118. Frequently, the Service responds to requests for technical assistance from State agencies, local municipalities, and private landowners and developers who may have questions regarding whether specific activities may affect critical habitat. Technical assistance costs represent the estimated economic costs of informational conversations between these entities and the Service regarding the designation of critical habitat for the pygmy-owl. Most likely, such conversations will occur between municipal or private property owners and the Service regarding lands designated as critical habitat or lands adjacent to critical habitat. The Service's technical assistance activities are voluntary and occur in instances where a Federal nexus does not exist.

### 5.1.2 Section 7 Consultations

119. Section 7(a)(2) of the Act requires Federal agencies (Action agencies) to consult with the Service whenever activities that they undertake, authorize, permit, or fund may affect a listed species or designated critical habitat. There are scenarios under which the designation of critical habitat can result in section 7 consultations with the Service beyond those required by the listing. These include:

- New consultations, which can occur when activities involving a Federal nexus are proposed in critical habitat not thought to be currently occupied by the species; and

- Re-initiations of consultations, which result when consultations that previously occurred under the listing are re-initiated due to new information or circumstances generated by the designation. In some cases, consultations will involve the Service and another Federal agency only, such as the BLM. More often, they will also include a third party involved in projects on non-Federal lands with a Federal nexus, such as state agencies and private landowners.

120. During a consultation, the Service, the Action Agency, and the landowner manager applying for Federal funding or permitting (if applicable) communicate in an effort to minimize potential adverse effects to the species and/or to the proposed critical habitat. Communication between these parties may occur via written letters, phone calls, in-person meetings, or any combination of these. The duration and complexity of these interactions depends on a number of variables, including the type of consultation, the species, the activity of concern, and the potential effects to the species and designated critical habitat associated with the activity that has been proposed, the Federal agency, and whether there is a private applicant involved.

121. Section 7 consultations with the Service may be either informal or formal. *Informal consultation*, which consists of informal discussions between the Service, the Action Agency, and the applicant concerning an action that may affect a listed species or its designated critical habitat, is designed to identify and resolve potential concerns at an early stage in the

planning process. By contrast, a *formal consultation* is required if the Action Agency determines that the proposed action is likely to adversely affect the listed species or designated critical habitat in ways that cannot be resolved through informal consultation. Regardless of the type of consultation or proposed project, section 7 consultations can require substantial administrative effort on the part of all participants.

### 5.1.3 Project Modifications

122. The section 7 consultation process may involve some modifications to a proposed project. These modifications may be agreed upon by the Action Agency and the applicant and included in the project description as avoidance and minimization measures, or they may be included in the Service's biological opinion on the proposed action as discretionary conservation measures to assist the Federal agency in meeting their obligations under section 7(a)(1) of the Act.[94] In some cases, the Service may determine that the project is likely to jeopardize the continued existence of the species and/or destroy or adversely modify its designated critical habitat. In these cases the Service will include reasonable and prudent alternatives to the proposed project. The reasonable and prudent alternatives are typically developed by the Service in cooperation with the Action Agency and, when applicable, the applicant. Alternatively, the Action Agency can develop their own reasonable and prudent alternatives, or seek an exemption for the project. All of these project modifications have the potential to represent some cost to the Action Agency and/or the applicant.

## 5.2 Estimated Per Effort Costs of Consultations and Technical Assistance

123. Estimates of the cost of an individual consultation were developed from a review and analysis of historical section 7 files from a number of Service field offices around the country. These files addressed consultations conducted for both listings and critical habitat designations. Cost figures were based on an average level of effort for consultations of low, medium, or high complexity, multiplied by the appropriate labor rates for staff from the Service and other Federal agencies. Estimates take into consideration the level of effort of the Service, the Action Agency, and the applicant during both formal and informal consultations, as well as the varying complexity of consultations. Informal consultations are assumed to involve a low to medium level of complexity. Formal consultations are assumed to involve a medium to high level of complexity.

124. Section 7 consultation costs include the administrative costs associated with conducting the consultation, such as the cost of time spent in meetings, preparing letters, and in some cases, developing a biological assessment and biological opinion. The costs of reinitiating a consultation are assumed to be similar to conducting the original consultation,

[94] Section 7(a)(1) requires Federal agencies to utilize their authorities to further the purposes of the Act by carrying out programs for the conservation of listed species.

because the reinitiation generally involves time spent in meetings and preparing letters or new biological opinions. This analysis assumes that the economic impact associated with a non-substantive re-initiation is similar to the cost of an informal consultation and the economic impact associated with a substantive re-initiation is similar to the cost of a formal consultation. The cost of internal consultation, where the Service is the Action Agency, depends on the activity under consideration and may be similar to the costs of either informal or formal consultations.

125. Cost estimates for technical assistance are based on an analysis of past technical assistance efforts by the Service in southern Arizona (Tucson FWO). Technical assistance costs represent the estimated economic costs of informational conversations and letters between landowners or developers with no federal nexus and the Service regarding the designation of critical habitat for the pygmy-owl. Some communication will occur between municipal or private property owners and the Service regarding areas designated as critical habitat or lands adjacent to critical habitat.[95]

126. Estimated administrative costs associated with section 7 consultations, re-initiations, and technical assistance efforts are presented in Exhibit 5-1 (these are per effort estimates). The low and the high scenarios represent a reasonable range of costs for each type of interaction. For example, when the Service participates in technical assistance with a third party regarding a particular activity, the cost of the Service's effort is expected to be approximately $260 to $680. The cost of the third party's effort is expected to be approximately $600 to $1,500.

127. Cost estimates for technical assistance are based on analysis of past technical assistance efforts provided by the Tucson FWO. The Service's protocol in Southern Arizona is to send a letter listing the endangered, threatened, and proposed endangered/ threatened species that are likely or known to exist in the county to any entity proposing development activity. The Service may also send a letter that describes how a landowner can avoid take for the species.[96] In many cases, the Action Agency can immediately demonstrate that the activity will have no effect on the species or habitat, and no further action is needed. This analysis considers these interactions to be technical assistance if they do not lead to consultation between the Service, the Action Agency, and/or the third party. Costs associated with these efforts include the opportunity cost of time spent in writing and conversation, as well as staff costs by involved parties.

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[95] Approximately 10 percent of technical assistance efforts are expected to be attributable to critical habitat. Personal Communication with Service Biologist, Tucson Field Office, October 16, 2002.

[96] Written communication with the Service, Tucson Ecological Services Field Office, October 31, 2002.

**Exhibit 5-1**

**ESTIMATED ADMINISTRATIVE COSTS OF CONSULTATION AND TECHNICAL ASSISTANCE EFFORTS FOR THE PYGMY-OWL (PER EFFORT)**

| Critical Habitat Impact | Scenario | Service | Action Agency | Third Party | Biological Assessment[a] |
|---|---|---|---|---|---|
| Technical Assistance | Low | $260 | n/a | $600 | $0 |
| | High | $680 | n/a | $1,500 | $0 |
| Informal Consultation[b] | Low | $1,000 | $1,300 | $1,200 | $0 |
| | High | $3,100 | $3,900 | $2,900 | $5,600 |
| Formal Consultation[c] | Low | $3,100 | $3,900 | $2,900 | $5,600 |
| | High | $6,100 | $6,500 | $4,100 | $8,800 |

[a] A third party is assumed to bear the cost of a biological assessment. When no third party is involved, the Action Agency bears the cost.
[b] Internal consultations are assumed to involve approximately the same administrative cost as complex informal consultations, unless indicated otherwise. For internal consultations, the Service bears the costs otherwise borne by both the Service and the Action Agency.
Notes: Low and high estimates primarily reflect variations in staff wages and time involvement by staff. In the Tucson Office, technical assistance for the pygmy-owl is primarily in the form of a phone call and generally results in issuance of a letter. This Service Field Office estimates that it devotes approximately 25 percent of a full-time Biologist's time to technical assistance calls involving the pygmy-owl annually. An additional ten percent of a Biologist's time is devoted to informal consultation phone calls regarding the pygmy-owl. Personal Interview with Service Field Office Personnel, Tucson, August 6, 2002.
[C] When no third party is involved it is assumed that the formal consultation cost is the sum of the Service and action agency cost.
Sources: IEc analysis.

128. Exhibit 5-2 displays the estimated total number of consultations and technical assistance efforts anticipated to be associated with activities affecting proposed critical habitat areas for the pygmy-owl over the next 10 years (for a detailed explanation of the derivation of these estimates, see Sections 3 and 4).

**Exhibit 5-2**

**TOTAL NUMBER OF FUTURE CONSULTATIONS AND TECHNICAL ASSISTANCE IN PYGMY-OWL CRITICAL HABITAT AREAS (TEN YEARS)**

| Critical Habitat Impact | Number[b] | Cost |
|---|---|---|
| Technical Assistance | 5,000 | $10,900,000[c] |
| Informal Consultations | 100 | $1,550,000 |
| Formal Consultations[a] | 77 | $1,218,000 |
| **Total** | **5,077** | **$13.7 million** |

Notes:
[a]When no third party is involved it is assumed that the formal consultation cost is the sum of the Service and action agency cost.
[b] These estimates utilize the high end estimates of consultations and costs per consultation.
[C] Technical assistance estimates may appear high, but the Service's Tucson Office devotes approximately 25 percent of a full-time Service Biologist's time to technical assistance calls involving the pygmy-owl. The large number historically has resulted from concerns from private landowners with holdings within or adjacent to the previous critical habitat designation. This estimate assumes that there is no change in the rate of technical assistance over the next ten years. More realistically, the rate of technical assistance is likely to decline as the public obtains information on the listing and designation over time.
Source: Biologists in the U.S. Fish and Wildlife Service, Tucson AZ Field Office, Pima County Office Growth Projections.

129. This analysis provides estimates of the number and cost of several types of project modifications that may occur as a result of critical habitat designation for the pygmy-owl. These project modifications are anticipated because they have occurred as a result of past formal consultations that involved the pygmy-owl.[97] Because past consultations have considered habitat conditions and the previous designation of critical habitat, they are likely to be good predictors of the types of modifications that the Service may require in the future as a result of critical habitat designation for the pygmy-owl.

130. Because the Service sometimes consults on the pygmy-owl in conjunction with several other species, some project modifications are not entirely attributable to the inclusion of the pygmy-owl in a consultation[98]. For example, past consultations have required habitat restoration, a measure that would benefit all endangered species present at the site, including the pygmy-owl. In other cases, project modifications are designed to specifically target the pygmy-owl or its habitat. The following discussion includes project modifications that are

[97] Based on analysis of Biological Opinions prepared by the Service that consider the pygmy-owl.

[98] However, the Service points out that in the Northwest Tucson area, consultations are typically focused on the pygmy-owl.

partially or wholly attributable to the inclusion of the pygmy-owl in a consultation, and may be required as a result of consultations on pygmy-owl critical habitat in the future.

## 5.3 Economic Impacts to Housing/Residential Development Sector: Conceptual Framework

131. Of particular concern to communities in which critical habitat has been proposed for designation is the potential for adverse economic impacts arising from constrained residential development. In this section, a brief conceptual overview and description of these types of impacts is provided. Then estimates are provided, where adequate data are available, of the likely magnitude of these impacts in the case of the pygmy-owl designation in the greater Tucson area.

132. The nature and magnitude of any economic impact attributable to critical habitat designation will depend upon baseline land and housing market conditions and the extent to which a designation distorts these equilibrium conditions. Land and housing markets reflect a variety of geographic, regulatory and socioeconomic factors that determine, in part, the shapes of respective demand and supply curves (i.e., elasticities, or responsiveness to price changes). For example, these markets reflect the abundance (or lack) of land suitable for development, existing zoning and land use regulations, and regional growth patterns in income and employment. Demand and supply relationships reveal how any potential regulatory changes brought about by critical habitat designation will be translated into measurable economic impacts.

133. An instructive starting point is a simple competitive partial equilibrium framework that includes markets for raw land, developed land, and housing. Designation of critical habitat may reduce the overall amount of land available to the market, which would be reflected in an inward shift of the supply curve for raw land.[99] This in turn may reduce supply and increase the price of developed land and housing, at least in the near term. These price changes have implications for each of the economic agents involved -- landowners, developers, builders and homebuyers, in terms of the economic surplus they accrue from transactions in the respective markets. The extent of these effects on overall economic welfare and how they are distributed among parties to the transactions depends upon the magnitude of the shifts, as well as the elasticity of demand and supply. This analytical framework can be used to measure the full cost to society of distortions in land and housing markets brought about by critical habitat designation.[100]

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[99] The value of a parcel of land reflects the present of value of all future services flowing from that land, of which development potential is a significant component. The likelihood of a supply response such as this depends on the extent of undeveloped land in a region, as well as the extent of developable land precluded from use (or restricted in its use) by habitat designation.

[100] Just, R.E., D. Hueth and A. Schmitz, Applied Welfare Economics and Public Policy, Prentice-Hall Inc, NJ, 1982.

134. Practically, however, it is very difficult to derive empirical estimates of changes in social welfare[101] in this manner. These difficulties arise in defining the spatial and temporal scope of the relevant markets and obtaining the data necessary to estimate the supply and demand relationships. As such, this analysis instead attempts to document each of the primary categories of potential economic impacts associated with habitat designation based on information obtained from regional land-use planners, developers and other knowledgeable parties, review of past section 7 consultations and public comments received on previous economic analyses of this type.[102]

### 5.3.1 Categories of Potential Economic Impacts

135. As noted, estimating an exact change in net social welfare[103] associated with land market distortions, should they occur as a result of critical habitat designation, is not practically feasible. However, it is possible to quantify some of the economic impacts anticipated to occur and address others qualitatively. Some of the principal concerns expressed in comments on past economic analyses relate to adverse impacts to developers, as well as the overall regional economic growth implications of critical habitat designation.

### 5.3.2 Impacts to Landowners, Developers, Builders and Consumers

136. As discussed above, critical habitat designation may inhibit the development potential of some parcels, thereby reducing the supply of developable land. In areas that are already highly developed, or where developable land is scarce for other reasons (i.e. non-critical habitat-related regulations), this reduction in available land and corresponding increase in price could be significant, and ultimately translate into fewer housing units being built within the affected market. In this case, both producers and consumers are affected, as landowners, developers and builders realize lower returns and homebuyers face higher prices. In other cases, however, impacts are likely to be limited to landowners only. In areas where developable land is relatively plentiful, developers and builders will identify substitute sites

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[101] "Social welfare" is defined as the economic well-being of society.

[102] Elliott D. Pollack and Company, The Economic and Fiscal Impact of the Designation of 60,060 Acres of Privately Owned Land in Pima County, Arizona as Critical Habitat for the Cactus Ferruginous pygmy-owl, prepared for Southern Arizona Homebuilders Association, February 25, 1999. Sunding, David, and David Zilberman, Economic Impacts of Critical Habitat Designation for the California Red-Legged Frog, prepared for Home Builders Association of Northern California and Sheppard, Mullin, Richter and Hampton LLP, January 22, 2001. Husing, John, Economics and Politics, Inc., San Bernardino Kangaroo Rat Economic Impact Study, memo prepared September 27, 2001.

[103] "Social welfare" effects are often referred to as efficiency effects, as distinct from effects that are purely distributive in nature (e.g., losses or gains in firm revenues or jobs).

for projects, thereby limiting economic impacts to the owners of specific parcels that suffer a diminishment in their land's value. This is not to say that effects on developers and builders would be nonexistent; presumably, if certain lands were originally chosen for a given project (perhaps because of their locational attributes, such as proximity to amenities, views, etc.), then those areas were perceived as superior relative to substitute areas. Ultimately, however, if adequate substitutes exist, economic impacts beyond the land market are likely to be modest and limited to reductions in profit associated with project modifications, project delays, and any additional development charges that may exist.[104]

### 5.3.3 Regional Economic Impacts

137. In addition to the primary economic impacts identified above, commenters on previous economic analyses of critical habitat designation have described additional categories of economic and financial effects in these markets, generally falling in the category of regional economic impacts.[105] Unlike the impacts described above, which reflect the welfare of *all* citizens under different resource allocations, regional economic impacts reflect changes in *local* output, employment and taxes. These types of impacts are generally assumed to be distributive in nature; that is, changes in economic activity in the local economy are offset by changes elsewhere. For example, if development is precluded from one community, this development may simply occur in another community in the same metropolitan area. Nonetheless, because the costs of government regulations are at times more concentrated within a region than are the benefits, it is important to acknowledge such impacts.

### 5.3.4 Impacts on Firms in the Construction Industry

138. The principal category of regional impact associated with critical habitat designation in areas of residential development involves potential changes in revenues and employment in construction-related firms and other industries that support builders and developers.

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[104] Watkins (1999) develops a theoretical model to demonstrate how the effects of development charges are borne by landowners, developers and builders. His results generally confirm that such charges encourage higher land and housing prices when demand for developed land is elastic (i.e. changes in the price of developed land are met with relatively larger changes in demand for developed land) and supply of raw land inelastic (i.e. changes in raw land prices are met with relatively smaller changes in demand for raw land) and that raw land owners tend to receive lower prices when supply of raw land is elastic. In either case, the developer bears one-half of such charges in the form of reduced profits. Watkins, A.R..1999. Impacts of Land Development Charges, Land Economics, 75(3) 415-24.

[105] Elliott D. Pollack and Company, The Economic and Fiscal Impact of the Designation of 60,060 Acres of Privately Owned Land in Pima County, Arizona as Critical Habitat for the Cactus Ferruginous pygmy-owl, prepared for Southern Arizona Homebuilders Association, February 25, 1999.

Specifically, commenters have suggested that if development activity decreases in a given area, these secondary industries are likely to suffer severe economic consequences. As discussed above, the extent of any such impacts depends upon prevailing supply and demand conditions. In rare cases where developers are severely constrained by habitat designation and significantly fewer residential units are ultimately constructed as a result, some short-term economic impacts will occur in these industries. However, in many cases, designation is more likely to redistribute housing units (location and density) than reduce absolute quantity, with negligible secondary economic impacts, because of the abundance of available substitutes for development sites in many parts of the western United States.

### 5.3.5 Changes in Local Government Tax Revenue and Other Impacts

139. A second category of regional impact identified by commenters to past critical habitat analyses concerns the potential for forgone tax revenues associated with reduced residential development. That is, reduced development potential in an area may lead to lower real estate and other tax revenues.[106] However, it is important to note the *net* impact of any expected changes in tax revenues in affected communities. That is, tax revenue reduction from reduced development should be compared to additional costs to municipalities associated with building and maintaining roads, schools, parks and other infrastructure and providing services such as law enforcement and health care that would be incurred if development occurred. In many cases the change in revenue will be offset by an equal change in municipal expense[107]; thus, it is important that any estimated impacts in this category are net of these service expenditures.

140. Finally, in more extreme cases, concern has been expressed regarding the broader impact of critical habitat designation on regional economies. Specifically, some individuals have questioned whether designation will delay and/or impair an area's ability to realize economic growth by influencing development patterns. Whether further development of a region is, on net, desirable is a point of contention in many markets. Nonetheless, with the exception of cases in which critical habitat designation precludes a large proportion of available land from development, designation is unlikely to substantially affect the course of regional economic development.[108]

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[106] Elliott D. Pollack and Company, The Economic and Fiscal Impact of the Designation of 60,060 Acres of Privately Owned Land in Pima County, Arizona as Critical Habitat for the Cactus Ferruginous pygmy-owl, prepared for Southern Arizona Homebuilders Association, February 25, 1999.

[107]Muro, Mark et al., "The Economics of Large-Scale Conservation: A Framework for Assessment in Pima County." Morrison Institute for Public Policy, 2002. See particularly Figure 2, "Types of Land Uses Ranked by Cost-Effectiveness for Governments."

[108] Meyer, Stephen M., 1998. "The Economic Impact of the Endangered Species Act on the Housing and Real Estate Markets." New York University Environmental Law Journal. 6(450):1-13.

## 5.4 Economic Impacts to the Housing/Residential Development Sector Associated with Pygmy-Owl Critical Habitat

141. In this section, the framework outlined above is drawn upon to estimate potential development-related economic impacts associated with habitat designation in the Tucson area. Based on conversations with the Service, Action agencies, local developers, Pima County, and PAG, a significant reduction in total residential development as a result of critical habitat designation is not expected. The County states that it does not anticipate issuing any fewer building permits in the Tucson area after the designation of critical habitat for the pygmy-owl, given availability of substitute housing sites in the area.[109] However, some impacts may be experienced in the form of project delays and required modifications that result in the reduction of profits to the individual developer. PAG also anticipates little overall reduction in housing development activity as a result of critical habitat for the pygmy-owl, while recognizing that individual developers may have to redesign some projects.[110] Exhibit 5-3 displays a summary of potential economic impacts to the residential development sector due to the critical habitat designation for the pygmy-owl, and describes how they are addressed in this analysis.

[109] Substitute areas include 132 square miles of State Trust Land southeast of Tucson. Schliesman, Kyle. 2002. "Land Use; Protecting the Sonoran Desert: Priceless?" Inside Tucson Business. http://www.azbiz.com/azbiz/myarticles.asp?H=1&S=358&P=580797&PubID=8675.

[110] Personal communication with Planner, Pima Association of Governments, October 9, 2002.

**Exhibit 5-3**

**SUMMARY OF POTENTIAL CATEGORIES OF ECONOMIC IMPACT TO RESIDENTIAL DEVELOPMENT SECTOR: PYGMY-OWL HABITAT DESIGNATION**

| Category | Inclusion in this Analysis | Description |
|---|---|---|
| Reduced revenues to landowners, developers and builders | Included | Estimated reduction in profits associated with project modifications |
| Off-site mitigation costs | Included | Estimated costs to purchase mitigation lands |
| Project Delays | Included | Estimated costs of delay in receipt of revenues |
| Increased value of new homes within critical habitat | Not Included | Given reduction in density of development, homes in developments that are required to perform on-site mitigation may sell for more than homes in developments without such on-site open space |
| Increased housing prices in region | Not Included | Not anticipated to occur given availability of developable land in the region and modest overall reduction in number of units constructed (less than 5 percent of total expected supply of new homes in Eastern Pima County may be affected) |
| Regional economic impacts | Not Included | Estimated to be insignificant due to large availability of substitute housing sites; distributed throughout the metropolitan area. Economic impacts are less than one percent of total development value |
| Secondary impacts to construction-related industries | Not Included | Not assumed to be significant given modest reduction in number of units constructed |
| Reduced Tax Revenue to Local Government | Not Included | For small changes in number of housing units constructed, analysis assumes that any changes in tax revenue will be offset by an equal change in municipal expenses |

## 5.5 Estimated Per-Effort Cost of Project Modifications Associated with Residential Development

142. Based on a review of past consultations that addressed development and the pygmy-owl, this analysis finds that modifications to the scope or design of a typical development could range from minor to significant changes. Three categories of costs are quantified, on-site mitigation, project delays, and other project modifications. On-site mitigation captures the cost of setting aside conservation lands on-site by reducing the number of housing units in the project. Delay in the realization of profit and cost of holding on to land captures the cost to the developer of delay of construction caused by going through the consultation process. Other project modifications are those that were required in past consultations. Other project modifications include off-site mitigation, habitat restoration and enhancement,

conducting pygmy-owl studies funding Service conservation efforts, education programs and fence construction.[111]

### 5.5.1 Estimated Per Effort Costs of Project Modifications Associated with Residential Development

143. **On-Site Mitigation.** Past consultations on developments that involved the pygmy-owl have frequently resulted in landowners setting aside conservation lands on-site. In the past, the Service used "80-20 guidance", which requires projects to limit vegetation disturbance to 20 percent of the site.[112] By setting aside on-site lands, some alterations to proposed development plans have occurred. Based on past modifications to housing projects, this analysis assumes that, on average, changes to the scope of a typical development project will reduce the number of housing lots developed to their "highest and best use" in the range of four to seven percent.[113] Using this assumption, this analysis arrives at an estimate of an average decrease in profitability caused by a reduction in the number of fully developable lots that ranges from $39,000 to $651,000 per project (or three percent or less of total expected revenues). Other assumptions used to derive this estimate include:

- Impacts are estimated for two potential development sizes. The first is the average development in these counties, 375 units, based on the average size of developments that took part in past consultations on the pygmy-owl. The second is a smaller yet common development size in northwest Tucson of 150 units.[114]

- All homes are sold at the median range for the area market;

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[111] The Service states that two consultations were initiated after the remand of critical habitat, but are not yet completed. Since neither was available at the time of this analysis, these consultations are not included in the cost estimation. Thus, because this analysis does not include these consultations, the estimated costs attributable to critical habitat are likely to be overstated.

[112] The Arizona Game & Fish Department is currently determining whether the 80-20 guideline should be revised. If modified, the rule is likely to increase the percentage of minimum allowable vegetation disturbance.

[113] This range is based on the 20$^{th}$ and 80$^{th}$ percentile of past consultations requiring on-site mitigation involving a reduction in the number of housing lots.

[114] Based on past consultations and confirmed through conversations with local developers, May 6, and August 29, 2002.

- Home sale values will fall within the range of similar developments in the area; $181,000 to $267,000 in Pima County and $140,000 to $200,000 in Pinal County; [115]

- Development will follow current trends;

- Average percent profit to the developer per home sale price is five to ten percent.[116]

144. Exhibit 5-4 displays the per-effort estimates of on-site mitigation associated with development activities affecting critical habitat for the pygmy-owl.

[115] Based on current retail price of new homes for 67 percent of the developments that went through the formal consultation process for the pygmy-owl. Found through iNest, Arizona Builders By Location ( http://internest.com/xyz/ViewAZ.asp?PageNum=13, As viewed on August 13, 2002). Confirmed through conversations with local developers, May 6, and August 29, 2002.

[116] The range of average percentage profit to the developer is based on a review of local developers Economic Feasibility Reports, June 13, 2000, RMA's 2001 Annual Statement Studies of land subdividers and developers profit before taxes (comparable National profit margins range from 7.8 to 15.4 percent) and confirmed by personal through conversations with local developers, August 29, 2002.

**Exhibit 5-4**

**POTENTIAL COSTS ASSOCIATED WITH ON-SITE MITIGATION FOR RESIDENTIAL DEVELOPMENT PROJECTS, 2002-2012**

| County | Range | Home Sale Price[a] | Percent Profit[b] | Average Profit per Home | Number of Lots per Development[c] | Lost Lot Margin[d] | Lots Not Developed Due to Project Modification | Reduced Profit per Project |
|---|---|---|---|---|---|---|---|---|
| **Pima** | Low | $181,000 | 5% | $9,100 | 150 | 3.7% | 6 | $50,000 |
| | High | $267,000 | 10% | $26,700 | 375 | 6.5% | 24 | $651,000 |
| **Pinal** | Low | $140,000 | 5% | $7,000 | 150 | 3.7% | 6 | $39,000 |
| | High | $200,000 | 10% | $20,000 | 375 | 6.5% | 24 | $488,000 |

Source: Area developers Economic Feasibility Reports, Arizona Real Estate Agents, conversations with local developers, August 2002. RMA 2001, national profit margin before taxes for land subdividers and developers.
Notes: The above estimates represent the combined low and high scenarios.
[a] Based on current retail price of new homes for 67 percent of the developments that went through the formal consultation process for the pygmy-owl. Confirmed in conversations with local developers, May 6, August 29, 2002.
[b] The range of average percent profit to the developer is based on a review of local developers Economic Feasibility Reports, June 13, 2000, RMA's 2001 Annual Statement Studies of land subdividers and developers profit before taxes (comparable National profit margins range from 7.8 to 15.4 percent) and confirmed by personal communication with local developers, August 29, 2002.
[c] Based on past consultations and common development size. Confirmed through conversations with local developers, May 6, and August 29, 2002.
[d] This range is based on the 20$^{th}$ and 80$^{th}$ percentile of past consultations requiring the on-site mitigation reducing the number of housing lots. Figures may differ from individual estimates due to rounding.

145. **Other Project Modifications.** Other project modifications are those that were required in past consultations, other than on-site mitigation, including off-site mitigation, habitat restoration and enhancement, conducting pygmy-owl studies funding Service conservation efforts, education programs and fence construction

146. **Costs of Delay.** The cost of project delays and whether delays should be included as a cost to developers is debatable. Both sides of the argument are represented by Dr. Stephen Meyer[117] and Dr. David Sunding.[118] Meyer holds that developers do not incur a real cost of delay because of section 7 implementation, and that delays can be avoided with better planning.[119] Sunding disagrees asserting there is a real cost of section 7 implementation in critical habitat areas.[120] This analysis follows Sunding's argument that the delay associated with going through the consultation process costs the developer by extending the period before profits are realized and by adding a cost to hold the land longer than anticipated. The delay in realization of profits is captured by calculating the present value of the profit stream at the developers weighted average cost of capital. Part of the cost of holding on to the land, the increased interest on a loan payment, is captured by taking the present value of the profit stream with a delay compared to an identical project outside of critical habitat that experiences no delay. Additional taxes are also accrued while holding the land.[121]

- **Project Delay.** Past consultations have been of varied length, ranging from five months to over three years, and have averaged 18 months. Delays associated with consultation can have a significant financial impact on the individual developer.

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[117] Meyer, Stephen M., Review of the draft document Analytical Framework for Economic Analysis of Critical Habitat Designation prepared for the U.S. Fish and Wildlife Service. August 24, 2002.

[118] Sunding, David L., Review of the draft document Analytical Framework for Economic Analysis of Critical Habitat Designation prepared for the U.S. Fish and Wildlife Service. September 13, 2002.

[119] "The true cost imposed by project review (e.g., the need to hire lawyers, biological consultants, ect.) are real costs imposed by the ESA-CH (Endangered Species Act, critical habitat) designation process. However, 'project delays' and 'regulatory uncertainty' may be as much a function of a property owner's/manger's poor planning... as it is a regulatory burden." "My review, for example, of the impact of the Golden-Cheeked warbler listing found no effect on real estate prices in counties with listed habitat. I am unaware of any documentation of such effects."

[120]"Section 7 consultation adds another layer of bureaucracy to the permitting process and can delay completion of the project. The applicant must conduct required investigations that can easily take months to complete; the entire Section 7 consultation process can last for a year or more." "My previous work on the red-legged frog argued for the importance of considering delay costs." "Anecdotal evidence suggests that delay costs are significant in other cases of critical habitat designations as well."

[121] A more accurate and preferred method would be to conduct a detailed cash flow analysis. Such an analysis was not performed due to proprietary information issues.

- **Additional taxes.** While the developer holds the land zoned as bare land for 18 months, additional taxes of $39,000 are incurred.

147. To calculate the costs of delay to a developer, two impact scenarios have been developed. The first includes only project modifications which have historically been recommended at least 50 percent of the time. The second scenario includes those modifications assumed for Scenario 1, plus additional modifications that have been required less frequently as a result of past consultation. Project modifications in *Scenario 1* include delays, on-site mitigation, off-site mitigation, habitat restoration and enhancement, and conducting pygmy-owl studies. *Scenario 2* also includes funding Service conservation efforts, education programs and fence construction. The two Scenarios are then compared to a *without section 7 Scenario*, which represents the requirements that would exist absent section 7 requirements in pygmy-owl critical habitat areas. The difference between the no section 7 scenario and Scenarios 1 and 2 represents the estimated costs of delay to an individual developer. These two scenarios are discussed in detail in the following section.

**Cost Estimates for *Scenario 1* Project Modifications**

- **Off-Site Mitigation.** As an alternative to on-site mitigation, the 80-20 guideline also allows for the purchase off-site mitigation land at a ratio of 4 acres for every one acre of disturbance. During a section 7 consultation on a typical project within special management areas an applicant may fully offset 80 percent of the acreage by purchasing conservation land at a cost of approximately $10,000 per acre, as an alternative to on-site mitigation.[122] Past consultations have resulted in an average of half an acre of off-site mitigation land purchased per acre developed, indicating that developers frequently combine off-site with some on-site mitigation.

- **Habitat Restoration and Enhancement.** Based on a review of past formal consultations, the Service often requests habitat restoration and enhancement for individual projects. Habitat restoration includes revegetation and minimization of noise disturbance. The Service has frequently required developers to plant Velvet Mesquite trees as buffers to buildings, lights and noise.[123] Restoring and enhancing areas temporarily disturbed during construction or by previous land uses is estimated to cost between $1,900 and $7,000 per project.[124]

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[122] Personal Communication with Pima/Pinal County Developer, May 2002.

[123] The average cost of a 15 gallon Velvet Mesquite is assumed to be approximately $50. Civano Nursery. http://www.civanonursery.com/gardencenter/plants.htm#trees. As viewed on August 12, 2002. Arizona Cactus Sales. http://www.arizonacactussales.com. As viewed on August 12, 2002.

[124]Personal Communication with Pima/Pinal County Developer, May 2002.

- **Studies/Surveys.** Past consultations have frequently required studies of pygmy-owl behavior and occurrence. The costs associated with these studies are estimated to range from $1,200 to $29,600 annually depending on the scope of the project.[125]

**Cost Estimates For *Scenario 2* Project Modifications**

148. Scenario 2 includes all project modifications in *Scenario 1* plus modifications that have historically occurred more rarely as a result of past consultations involving the pygmy-owl.

- **Education Programs.** Past consultations have occasionally resulted in the requirement that a developer assist or create a public education program about pygmy-owl as part of mitigation efforts. Costs of similarly-outlined educational programs are estimated to range from $1,000 to $7,000.[126]

- **Fund Service Pygmy-owl Conservation Efforts.** In one past consultation a developer provided approximately $100,000 to the service to fund pygmy-owl surveys, genetic studies, or other conservation efforts.[127]

- **Fencing.** A review of past consultation records indicates that, a small percent of the time, a developer will be required to install fencing. Costs vary with the scope of the project and can range from $22,000 to $50,000.[128]

149. Exhibit 5-5 illustrates the difference between the present value of a project under three scenarios; Scenario 1 and 2 as developed above and a without section 7 scenario, which represents the requirements that would exist absent section 7 requirements in pygmy-owl critical habitat areas. Under the without section 7 scenario, build out can begin immediately

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[125]Personal Communication with Pima/Pinal County Developer, May 2002.

[126] Due to lack of available information, the cost of education has been extrapolated from other Economic Analysis. The sources for these data are: Interviews with Jones & Stokes Associates, Inc., Irvine CA, May 2001 and Dudek and Associates, Encinitas, CA, April 2001, and with senior biologists at Tetra Tech, Inc., San Bernardino CA; SJM Biological Consultants, San Diego CA; P & D Environmental, Orange CA; Dames and Moore, Inc., Rancho Cucamonga CA; a consulting botanist located in Santa Ana CA; and Natures Image, Inc., CA.

[127] Biological Opinion for Proposed Dove Mountain Mixed Use Housing Development, October 23, 2002. The Service indicate's that this was a voluntary contribution on the part of the developer. Personal Communication Service Field Office, Tucson, October 16, 2002.

[128]Personal Communication with Pima/Pinal County Developer, May 2002.

and is completed within 18 months.[129] In Scenarios 1 and 2, with section 7 requirements, construction is delayed for 18 months.

150. The cost of the delay resulting from a consultation is estimated by projecting the present value of each scenario to a developer. The difference in present value of a project with a five percent profit margin in the *without section 7 Scenario* versus *Scenario 1* is $1,659,000; the difference in present value of that same project with a ten percent profit margin would be $1,749,000. The difference in present value of a project with a five percent profit margin in the *without section 7 Scenario* and *Scenario 2* is $1,913,000; the difference in present value of that same project with a ten percent profit margin would be $2,004,000. Thus, the estimated costs of delay for a developer are estimated to range from $1.7 to $2.0 million per consultation, depending on the projected profit margin of the developer, as well as the size and other particulars of the development being considered.

**Exhibit 5-5**
**ESTIMATED ECONOMIC COSTS ASSOCIATED WITH DELAY IN REALIZED PROFIT AND PROJECT DELAYS**
**(PER EFFORT)**

| Action | | Without Section 7 Requirements | Scenario 1 Costs | Scenario 2 Costs |
|---|---|---|---|---|
| Additional Taxes | Nominal Cost | n/a | -$39,200[a] | -$39,200 |
| | Present Value | n/a | -$37,700 | -$37,700 |
| Off-Site Mitigation | Nominal Cost | n/a | -$1,440,000 | -$1,440,000 |
| | Present Value | n/a | -$1,333,000 | -$1,333,000 |
| Habitat Restoration and Enhancement | Nominal Cost | n/a | -$7,000 | -$7,000 |
| | Present Value | n/a | -$6,500 | -$6,500 |
| Studies/Surveys | Nominal Cost | n/a | -$29,600 | -$29,600 |
| | Present Value | n/a | -$27,400 | -$27,400 |
| Education Programs | Nominal Cost | n/a | n/a | -$7,000 |
| | Present Value | n/a | n/a | -$6,500 |
| Fund Service Conservation Efforts | Nominal Cost | n/a | n/a | -$100,000 |
| | Present Value | n/a | n/a | -$92,600 |
| Fencing | Nominal Cost | n/a | n/a | -$50,000 |
| | Present Value | n/a | n/a | -$46,300 |
| Delay of 5% Profit Margin on all Home Sales in a development | Nominal Cost | $4,500,000 | $4,500,000 | $4,500,000 |
| | Present Value | $4,247,000 | $3,993,000[b] | $3,993,000[b] |

[129] Assuming typical build out rate of 25 units per month. Economic Feasibility Reports of local developers. Confirmed through conversations with local developers May 6, August 29, 2002.

**Exhibit 5-5**
**ESTIMATED ECONOMIC COSTS ASSOCIATED WITH DELAY IN REALIZED PROFIT AND PROJECT DELAYS**
**(PER EFFORT)**

| Action | | Without Section 7 Requirements | Scenario 1 Costs | Scenario 2 Costs |
|---|---|---|---|---|
| Delay of 10% Profit Margin on Home Sales on all Home Sales in a development | Nominal Cost | $9,000,000 | $9,000,000 | $9,000,000 |
| | Present Value | $8,494,000 | $7,986,000[c] | $7,986,000[c] |
| **Delay Cost for a developer with a 5% Profit Margin** | **Nominal Cost** | **$0** | **-$1,516,000** | **-$1,673,000** |
| | **Present Value** | **$0** | **-$1,659,000** | **-$1,913,000** |
| **Delay Cost for a developer with a 10% Profit Margin** | **Nominal Cost** | **$0** | **-$1,516,000** | **-$1,673,000** |
| | **Present Value** | **$0** | **-$1,749,000** | **-$2,004,000** |

[a]Costs are presented as negative numbers to distinguish them from profits, which are presented as positive numbers.
[b]Thus, the lost profit to a developer is $254,000.
[c]Thus, the lost profit to a developer is $453,000.
Source: Conversations with local developers, May 6, August 29, 2002, iNest, New Homes and New Home Builders, Area Developers Economic Feasibility Reports, and Biological Opinions.
Notes: Assumes a build out rate of a year and a half, a weighted cost of capital for land developers of 8.75 percent[130] and a social discount rate of three percent.[131]

## 5.6 Summary of Project Modification Costs Associated with Housing/Residential Development

151. Three categories of project modification costs are quantified in this analysis, including on-site mitigation, project delays, and other project modifications. The present value of on-site mitigation is estimated to range from $39,000 to $651,000 per consultation. The present value of additional taxes incurred by a developer while holding the land for 18 months is estimated at $39,000. The present value of other project modifications, which includes off-site mitigation, habitat restoration and enhancement, conducting pygmy-owl studies funding Service conservation efforts, education programs and fence construction**,** are estimated to range from $1,367,000 to $1,512,000 per consultation. The costs of delaying the realization of profit to an individual developer is estimated to range from $254,000 (Scenario 1) to $453,000 (Scenario 2). Thus, when the above project modifications are summed the total cost to a typical residential development ranges from $1.7 million to $2.7 million. However, this estimate is extremely conservative (i.e., more likely to overstate impacts than understate them) (See Caveats section).

[130] Ibbotson Associates. Cost of Capital 2001 Yearbook.

[131] Office of Management and Budget. Circular No. A-94. Appendix C (Discount Rates for Cost-Effectiveness).

152. Overall, given the availability of *substitute* housing sites in the study area, total residential development (i.e., the number of new housing units constructed) is not likely to decline as a result of the critical habitat designation for the pygmy-owl. It is likely, however, that project delays and required project modifications will result in some impacts (or increased costs) either to the land owner/seller, the land developer, or (possibly) the housing consumer. For example, if the full measure of these costs is borne by the land owner/seller in a designated critical habitat, then the value of the land is likely to decrease; that is, the seller will receive a lesser price under the designation for the same land. Alternatively, if the full measure of these costs is borne by the land developer, then the total dollar *revenues* to the developer could decrease by approximately three to eight percent (as much as $7,000 to $12,000 per home). Thus, in this scenario the developer experiences lower profit margins, but the price to the home buyer remains the same.

153. In the event that the housing consumer bears the full measure of these cost impacts by virtue of purchasing a home in a critical habitat designation area, the purchaser could experience an increase in home prices with a concurrent increase in amenities, including more open space or larger lot size. It is important to note, however, that these amenities may be offset by *disamenities*, including a decrease in actual home size (i.e., in square footage). Analysis suggests that consumers in the immediate area surrounding the critical habitat are not likely to experience a comparable increase in home prices.

## 5.7 Caveats

154. The following is a discussion of the limitations and assumptions of the residential development cost model.

155. The above cost analysis assumes that there are no benefits associated with preserving open space on-site or with increasing lot size. One estimate provided by Pima County Assessors Office suggest that a bare lot premium of $30,000 to $50,000 exists for lots in critical habitat.[132]

156. It is assumed that the average development project is delayed 18 months due to the consultation process. It should be noted that the length of the consultation process is not entirely attributable to the Service but also includes the time it takes for consultants to prepare and revise biological assessments.

157. By including project modifications and an18 month delay, this analysis estimates that $1.7 to $2.7 million in developer profits may be incurred per consultation. However, this estimate assumes that developers do not account for any of the delays that may occur in their planning efforts. More realistically, developers may incorporate this delay into their planning efforts, which would significantly reduce the costs estimated in this model.

[132] Personal Communication Pima County Assessors Office, September 18, 2002.

158. All projects modifications required in past consultations are included in this analysis to be conservative (i.e., more likely to overstate impacts than understate them). Costs are not weighted by likelihood of being required and total cost is anticipated to be an overstatement of total costs.

159. This analysis assumes that the density of development in the study area does not change as a result of changes to development plans. Because of the availability of near perfect substitutes there is nothing to indicate development would not continue at projected densities in the study area.

160. A more accurate and preferred method would be to conduct a detailed cash flow analysis. Such an analysis was not performed due to proprietary information issues and lack of detailed information.

161. Wildcat subdividing in unincorporated areas could increase as a secondary effect of changes to regulations on developable lots in incorporated areas. Wildcat subdividing is the unregulated creation of residential lots, often without basic infrastructure, conformance to standard environmental regulation, subdivision standards or infrastructure requirements common in regulated subdivided land.[133] The potential exists for accelerated wildcat subdividing by increasing development restrictions in regulated areas, thus making this form of development more desirable.

162. In addition, the cost estimates presented above could overstate the costs that will result from critical habitat designation due to pre-existing limits on development within Pima County (i.e. costs presented here may in fact have been experienced in baseline, absent the designation). Pima County's Comprehensive Plan already imposes stringent mitigation targets for permitted development in many areas of the county. The estimates presented in this report do not take these limits into account, and thus assume that all delays and mitigation efforts are likely to result from the listing and critical habitat designation of the pygmy-owl.

## 5.8 Estimated Per Effort Costs of Project Modifications Associated with Livestock grazing and Ranching

163. Past formal consultations on livestock grazing and ranching activities have primarily been with BLM, which manages many of the lands where livestock grazing occurs in pygmy-owl habitat. Past consultations have been both programmatic (addressing numerous livestock grazing leases), and reauthorizations of individual allotments. Past programmatic consultations have included project modifications such as surveying for the occurrence of

[133] From the Wildcat Subdivision Study by the County Administrators's Office, Pima County Arizona, 1998.

pygmy-owls, limiting utilization rates, fencing, and prohibition of livestock grazing in riparian areas. Past individual allotment consultations included project modifications such as surveying for the occurrence of pygmy-owls, fencing, and monitoring. See Exhibit 5-5 for a review of all livestock grazing and ranching related project modification costs.

164. Past programmatic consultations for livestock grazing activities included project modifications such as surveying for the occurrence of pygmy-owls, limiting utilization rates, fencing, and/or prohibition of livestock grazing in riparian areas.

### 5.8.1 Project Modifications Associated with Programmatic Livestock grazing Consultations

- **Studies/Surveys.** Past consultations have required studies of pygmy-owl behavior and occurrence. The costs of these studies range from $3,000 to $5,000 annually, depending on the scope of the project.[134]

- **Fencing.** Past consultations have required the construction of cattle fences to control the movement of cattle near sensitive habitat. Costs to construct these fences is $4,000 per mile.[135]

- **Limiting Utilization Rates.** Past projects have required limitations on utilization rates of allotments to maintain range condition and restore degraded sites. The costs associated with limiting utilization rates are estimated to range from $100 to $10,000 depending on the number of allotments affected.[136] Note that limitations on utilization rates are usually stipulations proposed by BLM on livestock grazing leases (i.e. under baseline), and thus the section 7 consultation process may not have an additional effect on utilization rates.

- **Prohibition of Livestock grazing in Riparian Areas and Washes.** Past project modifications for livestock grazing activities have requested that livestock grazing in flood plains be halted altogether. This analysis assumes that the costs associated with this type of modification are captured in the costs of fencing.

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[134] Personal Communication with BLM Personnel, Tucson Field Office, October 2, 2002.

[135] Personal Communication with BLM Personnel, Tucson Field Office, October 2, 2002.

[136] Bureau of Land Management, Safford Field Office Web Site, http://www.az.blm.gov/sfo/whatwedo.html, Accessed on 8/21/2002. Bureau of Land Management. "Current Rates for Livestock grazing." http://www.nv.blm.gov/range/Current_Rates.htm, Accessed on 8/21/2002.

### 5.8.2 Project Modifications Associated with Consultations on Individual Livestock Grazing Allotments

- **Studies/Surveys.** Surveys and studies were required as a result of past consultations on individual livestock grazing allotments. As stated above, the costs of conducting surveys are estimated to range from $3,000 to $5,000.[137]

- **Fencing**. Past consultations on individual allotments have required fence construction. As stated above, costs vary with the scope of the project. Cost of constructing fencing is $4,000 per mile.[138] Based on past projects costs can range from $16,000 to $20,000.

**Exhibit 5-6**

**ESTIMATED ECONOMIC COSTS ASSOCIATED WITH POTENTIAL PROJECT MODIFICATIONS FOR LIVESTOCK GRAZING ACTIVITIES (PER EFFORT)**

| Potential Project Modification | Costs | |
|---|---|---|
| | Low | High |
| Surveys | $3,000 | $5,000 |
| Fencing | $16,000 | $20,000 |
| Limiting Utilization Rates | $100 | $10,000 |
| Prohibition of Livestock grazing in Riparian Areas | (included as part of fencing) | (included as part of fencing) |
| **Total Project Modification Costs** | **$19,100** | **$35,000** |

Source: Interviews with Service Field Office, Tucson, Biological Opinions, and Bureau of Land Management Personnel, Arizona Field Office.

## 5.9 Estimated Per Effort Costs of Project Modifications Associated with Mining Activities

165. Review of consultation records indicate that there has been a single historical formal consultation regarding mining, which involved a land exchange with BLM and a mine operator. Future consultations may include land exchanges, wherein the BLM sells or exchanges a portion of their current holdings for lands that are owned by private parties that are less suitable for mining operations. While the Service estimates six future consultations on mining activities in the next ten years, the costs of mining project modifications are difficult to estimate. This analysis estimates the following project modifications are likely. See Exhibit 5-7 for a review of all mining related project modification costs.

[137] Personal Communication with BLM Personnel,Tucson Field Office, October 2, 2002.

[138] Ibid.

**Exhibit 5-7**

**ESTIMATED ECONOMIC COSTS ASSOCIATED WITH POTENTIAL PROJECT MODIFICATIONS FOR MINING ACTIVITIES (PER EFFORT)**

| Potential Project Modification (one project) | Costs | |
|---|---|---|
| | Low | High |
| Habitat Restoration and Enhancement | $1,900 | $7,000 |
| Revegetation | $500 | $5,000 |
| Studies/Surveys | $1,200 | $29,600 |
| **Total Project Modification Costs** | **$3,600** | **$41,600** |

Source: Interviews with Tucson Field Office Personnel, Biological Opinions, Conversations with consultants, BLM, local developers, and Civano Nursery.

### 5.9.1 Estimated Per Effort Costs of Project Modifications Associated with Mining Activities

- **Habitat Restoration and Enhancement.** Based on a review of past formal consultations, projects will require habitat restoration and enhancement. Restoring and enhancing the areas temporarily disturbed during construction or by previous land uses can cost between $1,900 and $7,000 per project.[139]

- **Re-vegetation/Minimization of Noise Disturbance.** Past consultations have required re-vegetation. The Service typically requires developers to plant velvet mesquite trees to buffer buildings, lights and noise.[140] The cost to re-vegetated a site ranges from $500 to $5,000.

[139] Consultants contacted stated that mining mitigation costs may or may not be higher than development mitigation costs. Due to the unavailability of mining mitigation costs, this analysis bases costs on developer costs.

[140] The average cost of a 15 gallon Velvet Mesquite is assumed to be approximately $50. Civano Nursery. http://www.civanonursery.com/gardencenter/plants.htm#trees. As viewed on August 12, 2002. Arizona Cactus Sales. http://www.arizonacactussales.com. As viewed on August 12, 2002.

C **Studies/Surveys.** Past consultations have required studies of pygmy-owl behavior and occurrence. The costs associated with these studies ranges from $1,200 to $29,600 annually depending on the scope of the project.[141]

## 5.10 Estimated Per Effort Costs of Project Modifications Associated with Immigration and Naturalization Service Activities

166. There is no history of formal consultations with the Service and INS on the pygmy-owl. However, based on interviews with Service personnel, future project modifications may include conducting surveys and limiting off-road vehicle use.[142] See Exhibit 5-8 for a review of all INS related project modification costs.

**Exhibit 5-8**

**ESTIMATED ECONOMIC COSTS ASSOCIATED WITH POTENTIAL PROJECT MODIFICATIONS, IMMIGRATION AND NATURALIZATION SERVICE ACTIVITIES (PER EFFORT)**

| Potential Project Modification | Costs | |
|---|---|---|
| | Low | High* |
| Surveys | $1,200 | $25,000 |
| Limiting Off Road Vehicle Use | negligible | negligible |
| **Total Project Modification Costs** | **$1,200** | **$25,000** |

Source: Interviews with Service Field Office Personnel, Tucson, and Biological Opinions.
* Note: The costs of surveys is based on estimates provided by the Buenos Aires National Wildlife Refuge.

### 5.10.1 Estimated Per Effort Costs of Project Modifications Associated with Immigration and Naturalization Service Activities

- **Studies/Surveys.** The costs associated with studies of pygmy-owl behavior and occurrence range from $1,200 to $25,000.[143]

- **Limiting Off Road Vehicle Use**. This modification is assumed to have little economic effect on this agency.

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[141] Based on residential development estimates. See Section 5.5.1.

[142]Personal communication with Biologist, Tucson Ecological Services Field Office, August 6, 2002.

[143] Based on Parks, Monuments, and Refuges estimate (see 5.3.5).

## 5.11 Estimated Per Effort Costs of Project Modifications Associated with Activities at Parks, Monuments and Refuges

167. Past formal consultations involving activities within national parks, monuments, wildlife refuges and other Federally managed lands have resulted in minor project modifications, including surveying for the occurrence of pygmy-owls and educational programs. See Exhibit 5-9 for a review of all park, monument and refuge related project modification costs.

**Exhibit 5-9**

**ESTIMATED ECONOMIC COSTS ASSOCIATED WITH POTENTIAL PROJECT MODIFICATIONS FOR PARKS, MONUMENTS AND REFUGES (PER EFFORT)**

| Potential Project Modification | Costs | |
|---|---|---|
| | Low | High* |
| Surveys | $1,200 | $25,000 |
| Educational Programs | $1,000 | $7,000 |
| **Total Project Modification Costs** | **$2,200** | **$32,000** |

Source: Interviews with Service Field Office Personnel, Tucson, and Biological Opinions.
* Note: The $25,000 upper bound figure for the costs of surveys is based on estimates provided by the Buenos Aires National Wildlife Refuge.

### 5.11.1 Estimated Per Effort Costs of Project Modifications Associated with Activities at Parks, Monuments and Refuges

- **Studies/Surveys.** All past consultations with NPS and FWS (internal consultations) have requested studies of pygmy-owl behavior and occurrence at a cost of $1,200 to $25,000.[144]

- **Educational Programs.** Past consultations have required educational programs ranging in cost from $1,000 to $7,000.[145]

## 5.12 Estimated Per Effort Costs of Project Modifications Associated with Road Construction/Maintenance/Improvement Activities

168. Past road construction, maintenance and improvement projects have resulting in project modifications. These include the purchase of off-site conservation lands, minimized

[144] Personal Communication with Buenos Aires National Wildlife Refuge, August 20, 2002.

[145] This estimate derived from development costs. See Section 5.1.1.

noise and vegetation disturbance, and the monitoring of construction activities both during and after completion of the project. See Exhibit 5-10 for a review of all road construction, maintenance and improvement related project modification costs.

**Exhibit 5-10**

**ESTIMATED ECONOMIC COSTS ASSOCIATED WITH POTENTIAL PROJECT MODIFICATIONS FOR ROAD CONSTRUCTION (PER EFFORT)**

| Potential Project Modification (one project) | Costs | |
|---|---|---|
| | Low | High |
| Off-Site Mitigation | $100,000 | $720,000 |
| Construction Monitoring | $5,000 | $25,000 |
| Minimize Noise & Vegetation Disturbance | $500 | $130,000 |
| **Total Project Modification Costs** | **$105,500** | **$875,000** |

Source: Interviews with Service Field Office Personnel, Tucson, ADOT, Biological Opinions, Chris Limberis, March 7, 2002. "Change is in Order." Tucson Weekly, and Civano Nursery.

### 5.12.1 Estimated Per Effort Costs of Project Modifications Associated with Road Construction/Maintenance/Improvement Activities

- **Off-Site Mitigation Lands**. Past consultations have required the purchase of off-site mitigation lands at a cost of $100,000 to $720,000 per project.[146]

- **Minimize Noise and Vegetation Disturbance.** Past consultations have required minimization of noise and vegetation disturbance at a cost of $500 to $130,000 per project.[147]

- **Monitor Construction Activities. Studies/Surveys.** Past consultations have required monitoring of construction activities and mitigation areas. The costs

[146] Based on acreage disturbance of past projects, a mitigation ratio of 4:1, and Pima County. 2002. Cost Model for Section 10 Endangered Species Act Compliance for All Impacts in the Unincorporated Areas. Memo.

[147] Based on residential development project modification costs. The Service typically requires developers to plant Velvet Mesquite trees to buffer buildings, lights and noise. The cost to re-vegetated a site ranges from $500 to $130,000. This number was provided in a March 7, 2002 article in the Tucson Weekly on the Thornydale Road between Ina and Cortaro Farms road project.

associated with pygmy-owl monitoring range from $5,000 to $25,000 annually depending on the scope of the project.[148]

## 5.13 Estimated Per Effort Project Modification Costs Associated with Utilities Construction Activities

169. Based on past biological opinions, project modifications for utilities construction activities are likely to include monitoring of construction activities and habitat restoration and enhancement.[149] See Exhibit 5-11 for a review of all road construction, maintenance and improvement related project modification costs.

**Exhibit 5-11**

**ESTIMATED ECONOMIC COSTS ASSOCIATED WITH POTENTIAL PROJECT MODIFICATIONS FOR UTILITIES CONSTRUCTION (PER EFFORT)**

| Potential Project Modification (one project) | Costs | |
|---|---|---|
| | Low | High |
| Studies/Surveys | $5,000 | $25,000 |
| Revegetation | $5,000 | $27,800 |
| **Total Project Modification Costs** | **$10,000** | **$52,800** |

Source: Interviews with Service Field Office Personnel, Tucson, ADOT, Biological Opinions, Chris Limberis. March 7, 2002. "Change is in Order." Tucson Weekly, and Civano Nursery.

### 5.13.1 Estimated Per Effort Costs of Project Modifications Associated with Utilities Construction Activities

- **Monitor Construction Activities.** Past consultations have required monitoring of construction activities. The costs associated with pygmy-owl monitoring range from $5,000 to $25,000 annually depending on the scope of the project.[150]

- **Habitat Restoration and Enhancement.** Habitat restoration includes re-vegetation and minimization of noise disturbance. In a past consultation on the construction of

[148] Personal Communication with Department of Transportation Environmental Planning Group Personnel, October 2, 2002.

[149] Biological Opinion for Thornydale Substation,, October 30, 2000 and AT&T Fiber Optic Line, April 5, 2001.

[150] Personal Communication with Department of Transportation Environmental Planning Group Personnel, October 2, 2002.

fiber optic lines, the cost to re-vegetate 12 miles was $27,800. Depending on the scope of the construction activity, restoring and enhancing areas disturbed during construction can cost between $5,000 and $27,800 per project.[151]

## 5.14 Summary of Consultation and Project Modification Costs

170. The cost estimates presented in Exhibit 5-12 are a function of the assumed number of technical assistance, consultations, and project modifications associated with activities affecting the proposed critical habitat for the pygmy-owl, along with the costs outlined above for each unit.

**Exhibit 5-12**

**TOTAL SECTION 7 COSTS ASSOCIATED WITH ACTIVITIES AFFECTING PROPOSED CRITICAL HABITAT FOR THE PYGMY-OWL (TEN YEARS)**

| Unit | Activity | Formal Consultations | Formal Consultation Cost[a] | Project Modification Cost | Total Activity Cost |
|---|---|---|---|---|---|
| 1 | Residential Development | 2 | $51,000 | $5,308,000 | $5,359,000 |
| | Livestock grazing | 0.25 | $5,000 | $9,000 | $14,000 |
| | INS | 2 | $43,000 | $50,000 | $93,000 |
| | Parks, Monuments and Refuges | 12 | $257,000 | $384,000 | $641,000 |
| | Utilities Construction | 1 | $26,000 | $53,000 | $78,000 |
| **Total** | | **17.25** | **$382,000** | **$5,804,000** | **$6,185,000** |
| 2 | Residential Development | 11 | $281,000 | $29,194,000 | $29,475,000 |
| | Livestock grazing | 0.25 | $5,000 | $9,000 | $14,000 |
| | INS | 1 | $21,000 | $25,000 | $46,000 |
| | Mining | 2 | $51,000 | $83,000 | $134,000 |
| | Parks, Monuments and Refuges | 2 | $43,000 | $64,000 | $107,000 |
| | Road Construction | 1 | $21,000 | $875,000 | $896,000 |
| | Utilities Construction | 1 | $26,000 | $53,000 | $78,000 |
| **Total** | | **18.25** | **$448,000** | **$30,303,000** | **$30,750,000** |

[151] Personal Communication with Pima/Pinal County Developers, May 2002.

**Exhibit 5-12**

**TOTAL SECTION 7 COSTS ASSOCIATED WITH ACTIVITIES AFFECTING PROPOSED CRITICAL HABITAT FOR THE PYGMY-OWL (TEN YEARS)**

| Unit | Activity | Formal Consultations | Formal Consultation Cost[a] | Project Modification Cost | Total Activity Cost |
|---|---|---|---|---|---|
| 3 | Residential Development | 13 | $332,000 | $35,223,000 | $35,555,000 |
| | Livestock grazing | 0.25 | $5,000 | $9,000 | $14,000 |
| | Road Construction | 4 | $86,000 | $3,500,000 | $3,586,000 |
| | Utilities Construction | 1 | $26,000 | $53,000 | $78,000 |
| **Total** | | **18.25** | **$449,000** | **$38,785,000** | **$39,233,000** |
| 4 | Residential Development | 7 | $179,000 | $18,578,000 | $18,757,000 |
| | Livestock grazing | 0.25 | $5,000 | $9,000 | $14,000 |
| | Mining | 2 | $51,000 | $83,000 | $134,000 |
| | Road Construction | 1 | $21,000 | $875,000 | $896,000 |
| **Total** | | **10.25** | **$256,000** | **$19,545,000** | **$19,801,000** |
| 5 | Livestock grazing | 1 | $21,000 | $35,000 | $56,000 |
| | Mining | 2 | $51,000 | $83,000 | $134,000 |
| | INS | 2 | $43,000 | $50,000 | $93,000 |
| | Parks, Monuments and Refuges | 8 | $171,000 | $256,000 | $427,000 |
| **Total** | | **13** | **$286,000** | **$424,000** | **$710,000** |
| Informal Consultations | | 100 | $1,550,000 | $0 | **$1,550,000** |
| Technical Assistance | | 5,000 | $10,900,000 | $0 | **$10,900,000** |
| **TOTAL** | | | **$14 million** | **$94 million** | **$108 million** |

Sources: IEc Economic Analysis
Note: [a]When no third party is involved it is assumed that the formal consultation cost is the sum of the Service and Action Agency cost.
Any potential future consultation or other impact attributable to critical habitat presumes a pre-existing Federal nexus as identified in the preceding column. Differences may occur due to rounding.

## 5.15 Section 7 Costs Associated Solely with Designation of Critical Habitat

171. This section compares the total section 7 costs that may be associated with pygmy-owl critical habitat areas over the next ten years (including costs associated with the jeopardy provision) with those which would likely not occur absent the designation. As shown in Exhibit 5-13, 48 percent of future section 7 consultation costs within critical habitat areas are

estimated to stem solely from the designation of critical habitat for the pygmy-owl. Note that this estimate likely overstates actual costs, in part because it includes costs that are also attributable to other species as well as other State regulations. However, it is not possible to allocate these costs at this time. In addition, this analysis was conservative (i.e., more likely to overstate impacts than understate them) in attributing costs to critical habitat designation, i.e., costs are also attributed to critical habitat designation whenever it is uncertain whether co-extensive costs will occur.

- **Residential development.** The consultation history shows that 56 percent of formal consultations on residential development were initiated during the two-year designation of critical habitat for the pygmy-owl, while the remaining 44 percent occurred prior to the previous critical habitat designation or were completed after the remand. Further, when the previous designation was vacated, several ongoing consultations were halted, indicating that the designation may have had an impact on the rate of consultation on development activity for this species.[152] Thus, this analysis estimates that the same pattern of consultations will occur in the future: 56 percent of future residential development consultations would not have occurred absent critical habitat designation and thus are attributable to the designation of critical habitat.

- **Livestock grazing and Ranching.** The consultation history regarding livestock grazing and ranching demonstrates that consultations occurred before the original critical habitat designation, in areas which were not in the original or proposed critical habitat and on a state-wide programmatic scale. The rate of consultation on livestock grazing did not significantly change after critical habitat was designated in 1999 (approximately 2.5 consultations per year in each case), nor did it decline after the removal of critical habitat. However, previous programmatic livestock grazing consultations are anticipated to be reinitiated following critical habitat designation for the pygmy-owl. Thus, this analysis assumes that future consultations on livestock grazing within the proposed boundaries will be attributable to critical habitat.

- **Mining.** The consultation history regarding mining is limited, with only one consultation occurring in the past in the Tucson area on commercial mining, and one consultation on small sand and gravel activities.[153] Although it seems likely that Federal

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[152] However, a recent complaint filed by Defenders of Wildlife and the Center for Biological Diversity (April, 2002) may compel the ACOE and EPA to consult more regularly on development activities in areas that may contain pygmy-owls, even absent critical habitat designation. Thus, the difference implied by these scenarios may be less distinct in the future. This analysis assumes that these Action agencies will continue with their present behavior for the duration of the modeled time period.

[153] Note that the Service is expecting a Biological Assessment from EPA regarding the effects of the Mission Mine Multisector Permit on the pygmy-owl and other species. This consultation is not within the bounds of the proposed critical habitat.

agencies facing increased mining operations on their land are likely to have initiated consultations with Service in the past, little evidence exists to support this assertion. Thus, all future section 7 consultations and resultant project modifications on mining in pygmy-owl critical habitat are assumed to be attributable solely to critical habitat designation.

- **Border Patrol Activities.** The consultation history regarding the Immigration and Naturalization Service activity is limited. There have been no activities undertaken by consultations in the past but consultation is expected to occur in the next ten years. Thus, this analysis projects that any future INS consultations will be due to critical habitat designation, as no evidence exists to show that these would have occurred absent critical habitat.

- **Parks & Monuments.** The consultation history regarding activities on parks, monuments, and refuge indicate consultations on these areas occurred before the previous critical habitat designation and after the original critical habitat designation was remanded. In addition, parks, monuments, and refuges are concerned about pygmy-owl survival, and have created plans to provide habitat, even absent critical habitat. This analysis assumes that all future park, monuments, and refuges consultations would have occurred absent the critical habitat designation for the pygmy-owl.

- **Transportation Projects.** The consultation history regarding transportation projects, and Pima county information on planned capitol improvement projects indicates that the rate of consultation on the pygmy-owl is unlikely to change with critical habitat designation. Thus, this analysis concludes that future consultations on transportation projects within pygmy-owl critical habitat would have occurred absent the critical habitat designation for the pygmy-owl.

- **Utilities Construction.** Previous consultations regarding utilities construction activities occurred during the former critical habitat designation for the pygmy-owl. Thus, this analysis concludes that all future utilities construction consultations will be attributable to critical habitat designation.

- **Informal Consultations & Technical Assistance.** This analysis assumes that 90 percent of future informal consultations and technical assistance efforts likely to occur within pygmy-owl critical habitat would have occurred absent the critical habitat designation for the pygmy-owl.

172. Exhibit 5-12 above provides cost estimates (including consultation, project modification, and technical assistance costs) for all activities affecting pygmy-owl critical habitat in the next ten years. Exhibit 5-13 presents total section 7 costs as well as costs attributed solely to the proposed critical habitat for the pygmy-owl.

**Exhibit 5-13**

**COMPARISON OF TOTAL SECTION 7 COSTS AND COSTS ATTRIBUTABLE SOLELY TO THE PROPOSED CRITICAL HABITAT FOR THE PYGMY-OWL (TEN YEARS)**

| Unit | Activity | Total Section 7 Cost | | Costs Attributable Solely to Critical Habitat | |
|---|---|---|---|---|---|
| | | Low | High | Low | High |
| 1 | Residential Development | $3,427,000 | $5,359,000 | $1,919,000 | $3,001,000 |
| | Livestock grazing | $8,000 | $14,000 | $8,000 | $14,000 |
| | INS | $28,000 | $90,000 | $28,000 | $93,000 |
| | Parks, Monuments and Refuges | $178,000 | $641,000 | $36,000 | $36,000 |
| | Utilities Construction | $26,000 | $78,000 | $26,000 | $78,000 |
| **Total** | | **$3,667,000** | **$6,182,000** | **$2,017,000** | **$3,222,000** |
| 2 | Residential Development | $18,847,000 | $29,474,000 | $10,554,000 | $16,506,000 |
| | Livestock grazing | $8,000 | $14,000 | $8,000 | $14,000 |
| | INS | $14,000 | $46,000 | $14,000 | $46,000 |
| | Mining | $38,000 | $134,000 | $38,000 | $134,000 |
| | Parks, Monuments and Refuges | $30,000 | $107,000 | $6,000 | $6,000 |
| | Road Construction | $118,000 | $896,000 | $3,000 | $3,000 |
| | Utilities Construction | $26,000 | $78,000 | $26,000 | $78,000 |
| **Total** | | **$19,081,000** | **$30,749,000** | **$10,649,000** | **$16,787,000** |
| 3 | Residential Development | $22,273,000 | $34,834,000 | $12,473,000 | $19,507,000 |
| | Livestock grazing | $8,000 | $14,000 | $8,000 | $14,000 |
| | Road Construction | $472,000 | $3,586,000 | $12,000 | $12,000 |
| | Utilities Construction | $26,000 | $78,000 | $26,000 | $78,000 |
| **Total** | | **$22,779,000** | **$38,512,000** | **$12,519,000** | **$19,611,000** |
| 4 | Residential Development | $11,993,000 | $18,757,000 | $6,716,000 | $10,504,000 |
| | Livestock grazing | $8,000 | $14,000 | $8,000 | $14,000 |
| | Mining | $38,000 | $134,000 | $38,000 | $134,000 |
| | Road Construction | $118,000 | $896,000 | $3,000 | $3,000 |
| **Total** | | **$12,157,000** | **$19,801,000** | **$6,765,000** | **$10,655,000** |

**Exhibit 5-13**

**COMPARISON OF TOTAL SECTION 7 COSTS AND COSTS ATTRIBUTABLE SOLELY TO THE PROPOSED CRITICAL HABITAT FOR THE PYGMY-OWL (TEN YEARS)**

| Unit | Activity | Total Section 7 Cost | | Costs Attributable Solely to Critical Habitat | |
|---|---|---|---|---|---|
| | | Low | High | Low | High |
| 5 | Livestock grazing | $32,000 | $56,000 | $32,000 | $56,000 |
| | Mining | $38,000 | $134,000 | $38,000 | $134,000 |
| | INS | $28,000 | $93,000 | $28,000 | $93,000 |
| | Parks, Monuments and Refuges | $118,000 | $427,000 | $24,000 | $24,000 |
| **Total** | | **$216,000** | **$710,000** | **$122,000** | **$307,000** |
| Informal Consultations | | **$1,550,000** | **$1,550,000** | **$155,000** | **$155,000** |
| Technical Assistance | | **$10,900,000** | **$10,900,000** | **$1,090,000** | **$1,090,000** |
| **TOTAL** | | **$70 million** | **$108 million** | **$33.3 million** | **$51.8 million** |

Sources: IEc economic analysis.
* Note: Any potential future consultation or other impact attributable to critical habitat presumes a pre-existing Federal nexus as identified in the preceding column. This analysis assumes that some additional administrative costs are incurred as a result of critical habitat designation, even for consultations that would already have occurred absent critical habitat designation. These costs may result from activities specific to critical habitat issues, such as pinpointing activity locations, considering the potential for adverse effects, and incorporating critical habitat language into biological opinions. Thus, consultations associated with parks and monuments and transportation projects (which would have occurred absent critical habitat), are estimated to include up to $3,000 in administrative costs that can be attributed solely to critical habitat designation. Totals may not sum due to rounding.

173. Based on this analysis, the total upper-bound estimate of section 7 costs associated with the listing and proposed critical habitat designation for the pygmy-owl is $108 million over ten years in nominal dollars, or $76 to $92 million dollars in present value terms (see Exhibit 5-14). The total upper-bound estimate of section 7 costs associated solely with the proposed critical habitat designation for the pygmy-owl is $51.8 million over ten years ($36 million to $44 million dollars in present value terms), or 48 percent of the total section 7 costs associated with the listing and proposed critical habitat designation for the pygmy-owl. As discussed previously, additional regional economic impacts to various industries are possible but they not quantified because they are considered to be unlikely given the wide availability of substitute housing sites in eastern Pima County.

174. Exhibit 5-14 presents the discounted present value of total costs based on the OMB prescribed seven percent discount rate as well as three percent discount rate with the assumption that total costs are distributed evenly over the ten-year period. Discounted costs

are then annualized assuming that total costs will be evenly distributed across the ten-year period.

**Exhibit 5-14**

**SECTION 7 COSTS ATTRIBUTABLE TO LISTING & CRITICAL HABITAT (10 YEARS)**

| | Total Section 7 Costs | | Attributable Solely to Critical Habitat | |
|---|---|---|---|---|
| | **Low** | **High** | **Low** | **High** |
| *Total Costs (2002 dollars)* | *$70,000,000* | *$108,000,000* | *$33,320,000* | *$51,830,000* |
| Present Value (7%) | $49,410,000 | $76,140,000 | $23,400,0000 | $36,400,000 |
| Present Value (3%) | $60,000,000 | $92,480,000 | $28,420,000 | $44,210,000 |
| Annualized | $7,040,000 | $10,840,000 | $3,330,000 | $5,180,000 |

Note: This table presents nominal costs as well as the discounted present value of total costs based on the OMB prescribed seven percent discount rate as well as a three percent discount rate, with the assumption that total costs are distributed evenly over the ten-year period. Discounted costs are then annualized assuming that total costs will be evenly distributed across the ten-year period.

175. While the total economic costs associated with section 7 implementation for the pygmy-owl appear to be high, they must be considered in the context of the value of the economic activity that is predicted to occur over the next ten years in the region. In Pima and Pinal Counties, counties that include portions of the proposed critical habitat for the pygmy-owl, a total value of $10.6 billion is predicted for annual income and spending on area industries. Thus, the estimated upper-bound section 7 costs associated with the listing and proposed critical habitat designation of $108 million for the pygmy-owl represents less than one percent of the total value of economic activities annually in this area.[154]

[154] U.S. Bureau of Economic Analysis, "Regional Accounts Data: Local Area Personal Income," http://www.bea.doc.gov/bea/regional/reis/.

**Exhibit 5-15**
**CAVEATS TO THE ECONOMIC ANALYSIS**

| Key Assumption | Effect on Cost Estimate |
|---|---|
| Consultation rates will not decrease over time | ++ |
| The presence of other species (i.e. Pima pineapple cactus, lesser long nosed bat) has no influence on consultation/project modification costs | + |
| All delays and mitigation efforts associated with modifications to development plans during the consultation process are attributable to section 7 implementation for the pygmy-owl, and not to other pre-existing constraints on development (particularly stringent mitigation targets for permitted development in many areas of Pima County). | ++ |
| All future developments will be part of large-scale developments that will be subject to consultation | ++ |
| Developers will not account for any prospective delays to process as part of their planning efforts | +++ |
| There are no benefits to housing sale price of preserving open space on-site or having a larger lot with natural lands. | ++ |
| A developer will realize an average profit of 5-10% of each future home sales price | ? |
| Historic administrative consultation costs and specific project modifications are good predictors of future consultation behavior | ? |
| Historic consultations of residential developments are good indicators of future development types as far as number of units per development, median home price, etc. | ? |
| Density of future development will remain the same after project modifications are imposed due to critical habitat. | ? |
| Substitute development lots exist to offset loss units of development within critical habitat areas | - |

- : This assumption may result in an underestimate of real costs.
+ : This assumption may result in an overestimate of real costs.
? : This assumption has an unknown effect on estimates.

## 5.16 Potential Impacts on Small Businesses

176. Under the Regulatory Flexibility Act (as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever a Federal agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government

jurisdictions).[155] However, no regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.[156] SBREFA amended the Regulatory Flexibility Act to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities. Accordingly, the following represents a screening level analysis of the potential effects of critical habitat designation on small entities to assist the Secretary in making this certification.

177. This analysis first determines whether critical habitat potentially affects a "substantial number" of small entities in counties supporting critical habitat areas. While SBREFA does not explicitly define "substantial number," the Small Business Administration, as well as other Federal agencies, have interpreted this to represent an impact on 20 percent or greater of the number of small entities in any industry.[157]

### 5.16.1 Estimated Number of Small Businesses Affected: The "Substantial Number" Test

178. To be conservative, (i.e., more likely to overstate impacts than understate them), this analysis assumes that a unique entity will undertake each of the projected consultations in a given year, and so the number of businesses affected is equal to the total annual number of consultations (both formal and informal).[158]

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[155] 5 U.S.C. 601 et. seq.

[156] Thus, for a regulatory flexibility analysis to be required, impacts must exceed a threshold for "significant impact" **and** a threshold for a "substantial number of small entities." See 5 U.S.C. 605 (b).

[157] See U.S. Small Business Administration, The Regulatory Flexibility Act: An Implementation Guide for Federal Agencies, 1998. Accessed at: www.sba.gov/advo/laws/rfaguide.pdf on December 3, 2001.

[158] While it is possible that the same business could consult more than once, it is unlikely to do so during the one-year time frame addressed in this analysis. However, should such multiple consultations occur, they would concentrate effects of the designation on fewer entities. In such a case, the approach outlined here likely would overstate the number of affected businesses.

179. First, the *number* of small businesses affected is estimated;[159]

- Estimate the number of businesses within the study area affected by section 7 implementation annually (assumed to be equal to the number of annual consultations);
- Calculate the *percent* of businesses in the affected industry that are likely to be small;
- Calculate the *number* of affected small businesses in the affected industry;
- Calculate the *percent* of small businesses likely to be affected by critical habitat.

180. This calculation reflects upper bound assumptions and nonetheless yields an estimate that is still far less than the 20 percent threshold that would be considered "substantial." As a result, this analysis concludes that a significant economic impact on a substantial number of small entities will not result from the designation of critical habitat for the pygmy-owl. Nevertheless, an estimate of the number of small businesses that will experience effects at a significant level is provided below.

181. Small businesses in the construction and development industry could potentially be affected by the designation of critical habitat for the pygmy-owl if the designation leads to significant project modifications or delays associated with development. To be conservative (i.e., more likely to overstate impacts than understate them), this analysis assumes that a unique company will undertake each of the projected consultations in a single year and that each of these companies will be a small business. Thus, this analysis assumes that 33 unique companies will consult with the Service on development projects over ten years, or approximately 3.3 businesses per year. There are approximately 161 residential development companies in the counties in which critical habitat units are located.[160] Thus, approximately 2.0 percent of small residential development companies in Pima and Pinal Counties may be affected by the designation of critical habitat for the pygmy-owl annually. Because 2.0 percent reflects conservative (i.e., upper bound) assumptions and is far less than the 20 percent threshold that would be considered "substantial", this analysis concludes that a significant economic impact on a substantial number of small entities will not result from the designation of critical habitat for the pygmy-owl.

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[159] Note that because these values represent the probability that small businesses will be affected during a one-year time period, calculations may result in fractions of businesses. This is an acceptable result, as these values represent the probability that small businesses will be affected by section 7 implementation of the Act.

[160] Census Bureau, County Business Patterns, Accessed at: http://www.census.gov/epcd/cbp/view/cbpview.html on August 26, 2002.

182. To the extent that the designation of critical habitat for the pygmy-owl may lead to an increase in the number of formal consultations and project modifications, some mining operations, particularly the smaller operators in Pinal County, may be affected by the designation. The Service estimates that approximately six consultations are likely to occur within pygmy-owl critical habitat areas in the next ten years, or approximately 0.6 per year. There are approximately 66 mining companies in the counties in which critical habitat units are located.[161] Therefore approximately 0.9 percent of small mining companies in Pima and Pinal Counties may be affected by the designation of critical habitat for the pygmy-owl annually. Because 0.9 percent reflects conservative (i.e., upper bound) assumptions and is still less than the 20 percent threshold that would be considered "substantial", this analysis concludes that a significant economic impact on a substantial number of small entities will not result from the designation of critical habitat for the pygmy-owl.

### 5.16.2 Estimated Effects on Small Businesses: The "Significant Effect" Test

183. Costs of critical habitat designation to small businesses consist primarily of the cost of participating in section 7 consultations and the cost of project modifications. To calculate the likelihood that a small business will experience a significant effect from critical habitat designation for the pygmy-owl, the following calculations were made:

- Calculate the per-business cost. This consists of the unit cost to a third party of participating in a section 7 consultation (formal or informal) and the unit cost of associated project modifications. *To be conservative (i.e., more likely to overstate impacts than understate them) , this analysis uses the high-end estimate for each cost.*

- Determine the amount of annual sales that a company would need to have for this per-business cost to constitute a "significant effect." This is calculated by dividing the per-business cost by the three percent "significance" threshold value.

- Estimate the likelihood that small businesses in the study area will have annual sales equal to or less than the threshold amount calculated above. This is estimated using national statistics on the distribution of sales within industries.[162]

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[161] Census Bureau, County Business Patterns, Accessed at: http://www.census.gov/epcd/cbp/view/cbpview.html on August 26, 2002.

[162] This probability is calculated based on national industry statistics obtained from the Robert Morris Associated *Annual Statement of Studies: 2001-2002* and from comparison with the SBA definitions of small businesses.

- Based on the probability that a single business may experience significant effects, calculate the expected value of the number of businesses likely to experience a significant effect.

- Calculate the percent of businesses in the study area within the affected industry that are likely to be affected significantly.

184. Small businesses in the construction and development industries could potentially bear a per-business cost of $1.7 to 2.7 million. The annual sales that a company would need to have for this per-business cost to constitute a "significant effect" would be $90 million or lower. Based on national statistics, 100 percent of small developers and 100 percent of builders and general contractors in Pima and Pinal Counties will have sales smaller than this amount. Thus, the expected number of small businesses likely to experience a significant effect is 100 percent of 3.3, or 3.3 businesses annually. This number represents approximately 2.0 percent of construction and development companies in Pima and Pinal Counties. Because 2.0 percent reflects conservative (i.e., upper bound) assumptions and is still less than the 20 percent threshold that would be considered "significant," this analysis concludes that a significant economic impact on a substantial number of small entities will not result from the designation of critical habitat for the pygmy-owl.

185. Small businesses in the mining industry could potentially bear a per-business cost of $3,600 to $41,600. The annual sales that a company would need to have for this per-business cost to constitute a "significant effect" would be approximately $120,000 to $1.4 million. Based on national statistics, approximately seven percent of mining companies in Pima and Pinal Counties will have sales smaller than this amount. The expected number of small businesses likely to experience a significant effect is seven percent of 0.6, or 0.04 businesses annually. Even if the people bearing these costs were individuals, this number represents approximately 0.4 or 0.9 percent of mining companies in Pima and Pinal Counties.[163] Because 0.9 percent reflects conservative (i.e., upper bound) assumptions and is still less than the 20 percent threshold that would be considered "significant," this analysis concludes that a significant economic impact on a substantial number of small entities will not result from the designation of critical habitat for the pygmy-owl.

[163]It is worth noting that even if individuals were to consult with the Service (very unusual), the number of annual participants in such interactions would be approximately one every two years.

## POTENTIAL BENEFITS OF PROPOSED CRITICAL HABITAT SECTION 6

186. The published economics literature has documented that real social welfare benefits can result from the conservation and recovery of endangered and threatened species (Bishop (1978, 1980), Brookshire and Eubanks (1983), Boyle and Bishop (1986), Hageman (1985), Samples *et al*. (1986), Stoll and Johnson (1984)). Such benefits have also been ascribed to preservation of open space and biodiversity, both of which are associated with species conservation (see examples in Pearce and Moran (1994) and Fausold and Lilieholm (1999)). Likewise, regional economies and communities can benefit from the preservation of healthy populations of endangered and threatened species, and the habitat on which these species depend (ECONorthwest (2002)).

187. The primary goal of the Act is to enhance the potential for species recovery. Thus, the benefits of actions taken under the Act are primarily measured in terms of the value the public places on species preservation (e.g., avoidance of extinction, and/or an increase in a species' population). Such social welfare values may reflect both use and non-use (i.e., existence) values. For example, use values might include the potential for recreational use of a species, should recovery be achieved. Non-use values are not derived from direct use of the species, but instead reflect the utility the public derives from knowledge that a species continues to exist.

188. In addition, as a result of actions taken to preserve endangered and threatened species, various other benefits may accrue to the public. Such benefits may be a direct result of modifications to projects made following section 7 consultation, or may be collateral to such actions. For example, a section 7 consultation may result in the requirement for buffer strips along streams, in order to reduce sedimentation due to construction activities. A reduction in sediment load may directly benefit water quality, while the presence of buffer strips may also provide the collateral benefits of preserving habitat for terrestrial species and enhancing nearby residential property values (e.g., preservation of open space).

189. This chapter describes the benefits resulting from implementation of section 7 of the Act, in the context of areas affected by the proposed designation for the pygmy-owl. It then discusses the extent to which existing valuation studies can be used to monetize these benefits. Finally, it discusses whether these benefits can be defined on a unit-by-unit basis.

In particular, it considers the economic literature regarding the public's willingness to pay to preserve critical habitat for specific endangered bird species, as well as a study of potential regional economic benefits.

190. As discussed below, it is not feasible to fully describe and accurately monetize the benefits of this designation in the context of this economic analysis. The discussion presented in this report provides insight into the potential benefits of the designation based on information obtained in the course of developing the economic analysis. It is not intended to provide a complete analysis of the benefits that could result from section 7 of the Act. *Given these limitations, the Services believe that the benefits of critical habitat designation are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.*

## 6.1 Categories of Benefits

191. Implementation of section 7 of the Act is expected to substantially increase the probability of recovery for the pygmy-owl. Such implementation includes both the jeopardy provisions afforded by the listing as well as the adverse modification provisions provided by the designation. Specifically, the section 7 consultations that address the pygmy-owl will assure that actions taken by Federal agencies do not jeopardize the continued existence of the pygmy-owl or adversely modify its habitat. Note that these measures are separate and distinct from the section 9 "take" provisions of the Act, which also provide protection to this species.

192. The benefits of critical habitat designation can therefore be placed into two broad categories: (1) those associated with the primary goal of species recovery and (2) those that derive mainly from the habitat protection required to achieve this primary goal. In the case of the pygmy-owl, habitat protection provides for environmental benefits, including:

- **Decreased habitat loss** resulting from habitat protection, restoration, and enhancement projects including revegetation and limited utilization rates (i.e. reduced density of development).

- **Substitute habitat (mitigation)** resulting from habitat protection, enhancement, restoration, and enhancement projects and on- and off-site mitigation.

- **Preservation of open space** resulting from on- and off-site mitigation.

193. Exhibit 6-1 details those activities expected to generate section 7 consultations leading to project modifications associated with the proposed critical habitat for the pygmy-owl, organized by the category of physical/biological improvement expected to result from the project modification. For example, out of the 77 formal consultations anticipated, it is expected that 50 will result in project modifications providing for decreased habitat loss, substitute habitat, and preservation open space. These are expected to result from

consultations regarding residential development (33 consultations) and livestock grazing and ranching activities (2 consultations), mining (6 consultations), road construction (6 consultations), and utilities construction (3 consultations), spread across all five proposed critical habitat units. Note that estimates of future consultations provided in Exhibit 6-1 are conservative (i.e. more likely to overstate than understate the true number of project modifications that could result from Section 7 requirements associated with the pygmy-owl).

194. The physical/biological improvements implied by Exhibit 6-1 may in turn provide for a variety of economic benefits. For example, the purchase of on- and off-site mitigation lands may protect desert ecosystems and therefore improve recreational activities. The discussion below provides qualitative descriptions of the economic benefits associated with these environmental improvements. While it is possible to estimate the number of projects that will generate consultations requiring project modifications, as well as the number of acres set aside as project mitigation, existing data do not allow for complete monetization of the ecological implications of these requirements.

## 6.2 Benefits Associated with Species Recovery

### 6.2.1 Use Value

195. The value that the public holds for conservation of the pygmy-owl and its habitat may include a direct use component related to viewing opportunities. Pygmy-owls are highly sought by recreational bird watchers.[164] Similarly, individuals may value species preservation to the extent that it increases the probability of future non-consumptive use (i.e. option value). When large numbers of birding enthusiasts visit an area to see one or more species, the regional economy can also benefit (Manion et al. (2000)). Exhibit 6-2 provides examples of studies that have considered the economic benefit that accrues to birdwatchers. Data do not exist to allow for estimation of the number of additional bird viewing trips, or improved trips, that will result from actions taken to protect the owl under section 7. Thus, it is not possible to quantitatively describe or monetize this category of benefit.

### 6.2.2 Existence Value

196. A number of published studies have demonstrated that the public holds values for endangered and threatened species separate and distinct from any expected direct use of these species (i.e. willingness to pay to simply ensure that a species will continue to exist). These studies include Boyle and Bishop (1987), Elkstrand and Loomis (1998), Kotchen and Reiling (2000), and Loomis and White (1996). There is little doubt that the pygmy-owl

[164] The Service discourages birding enthusiasts from viewing pygmy-owls because of the high potential for disturbance. Written communication with Biologists, Tucson Ecological Services Field Office, October 2002.

provides for such values, and that these values will be enhanced by its survival and recovery. Monetary measures of existence values for bird species, and the critical habitat on which they depend, are discussed further in Exhibit 6-2.

**Exhibit 6-1**

**BENEFITS EXPECTED TO RESULT FROM THE IMPLEMENTATION OF SECTION 7 OF THE ACT FOR THE PYGMY OWL**

| Physical/Biological Improvement | Expected Project Modification | Activity | Critical Habitat Unit | Number of Expected Consultations[a] | Breakdown of Consultations | Quantification |
|---|---|---|---|---|---|---|
| Decreased habitat loss | Habitat Restoration and Enhancement, On- and Off-Site Mitigation, Revegetation/ Minimization of Noise Disturbance, Limited utilization rates | Residential Development, Livestock grazing, Mining. Road Construction, Utilities Construction | Unit 1 | 3 consultations | 2 development, 1 utilities | On-site lands set aside for development as project mitigation: 1,500-5,800 acres; off-site lands purchased for conservation as project mitigation: 1,900-4,800 acres of habitat |
| | | | Unit 2 | 15 consultations | 11 development, 2 mining, 1 road construction, 1 utilities | |
| | | | Unit 3 | 18 consultations | 13 development, 4 road construction, 1 utilities | |
| | | | Unit 4 | 10 consultations | 7 development, 2 mining, 1 road construction | |
| | | | Unit 5 | 2 consultations | 2 mining | |
| | | | All Units | 2 consultations | 2 livestock grazing | |
| Substitute habitat (mitigation) | Habitat restoration and enhancement projects, On- and Off-Site Mitigation | Residential Development, Mining, Road Construction, Utilities Construction | Unit 1 | 3 consultations | 2 development, 1 utilities | Same as above |
| | | | Unit 2 | 15 consultations | 11 development, 2 mining, 1 road construction, 1 utilities | |
| | | | Unit 3 | 18 consultations | 13 development, 4 road construction, 1 utilities | |
| | | | Unit 4 | 10 consultations | 7 development, 2 mining, 1 road construction | |
| | | | Unit 5 | 2 consultations | 2 mining | |

| Physical/Biological Improvement | Expected Project Modification | Activity | Critical Habitat Unit | Number of Expected Consultations[a] | Breakdown of Consultations | Quantification |
|---|---|---|---|---|---|---|
| Preservation of Open Space | On- and Off-Site Mitigation | Residential Development, Road Construction, Utilities Construction | Unit 1 | 3 consultations | 2 development, 1 utilities | Same as above |
| | | | Unit 2 | 13 consultations | 11 development, 1 road construction, 1 utilities | |
| | | | Unit 3 | 18 consultations | 13 development, 4 road construction, 1 utilities | |
| | | | Unit 4 | 8 consultations | 7 development, 1 road construction | |

[a] All 50 consultations will result in project modifications that provide for decreased habitat loss. Forty-eight will result in the substitute of pygmy-owl habitat. Forty-two will result in the preservation of open space.

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| **WILLINGNESS TO PAY STUDIES FOR THREATENED OR ENDANGERED BIRD SPECIES** | | | | |
| Bowker and Stoll (1988); Stoll and Johnson (1984) | *Species*:<br>Whooping crane<br><br>(Federally listed as endangered in 1967)<br><br>*Geographic Area*:<br>Birds migrate from Canada to Texas annually and have been observed in CO, ID, KS, MT, ND, NM, OK, TX, UT, WY, and elsewhere | Total resource value associated with the whooping crane, including both non-consumptive use and non-use value. Respondents were provided a hypothetical scenario where public funding to monitor and maintain a viable population of whooping cranes was terminated, resulting in the extinction of the species. Respondents were asked to accept or reject an offer to contribute annually to a trust fund that would purchase land so that the species might be preserved in the future. Each subject responded to a randomly selected dollar amount. | *Sample Frame*:<br>On-site users of Aransas National Wildlife Refuge and nonusers from Texas and four major cities (Los Angeles, Chicago, Atlanta, and New York)<br><br>*Sample Size*:<br>On-site: ~536 completed interviews<br>Mail survey: ~741 completed surveys<br><br>*Response Rate*:<br>On-site: 67 percent<br>Mail Survey: 36 percent<br><br>*Survey Mode*:<br>On-site and mail<br><br>*Payment Vehicle*:<br>Purchase of a permit to visit refuge (on-site and mail) and annual contribution to a trust fund (mail survey only) | $21.00 - $65.44 (1983 dollars)<br><br>Estimated annual household willingness to pay to protect the whooping crane (Bowker and Stoll (1988)<br><br>$4.47, $3.07 (1983 dollars)<br><br>Estimated mean willingness to pay for an annual permit to visit the refuge with and without the whooping crane, respectively; Stoll and Johnson (1984) |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| Boyle and Bishop (1987) | *Species*:<br>Bald eagle (Federally-listed as endangered in 1978; upgraded to threatened in 1995)<br><br>*Geographic Area*:<br>Wisconsin | The total economic value (i.e. particularly non-consumptive use values) Wisconsin residents place on the preservation of the Bald eagle. Respondents were first asked to assume that all existing funding to preserve the eagle is terminated and that without funding no organized effort to preserve the species would exist, thereby leading to species extinction in Wisconsin. Respondents were asked whether they would pay to become a member of a foundation that will be able to save the bald eagle. Participants responded to a randomly selected dollar amount. | *Sample Frame*:<br>1984 Wisconsin taxpayers (contributors and noncontributors to WI's existing Endangered Resources Donation Program)<br><br>*Sample Size*:<br>~790 completed surveys<br><br>*Response Rate*:<br>81%<br><br>*Survey Mode*:<br>Mail<br><br>*Payment Vehicle*:<br>Donation to a private foundation | $16.14 - $38.12 (1985 dollars)<br><br>Lower value indicates one-time mean willingness to pay per taxpayer who had <u>not</u> previously contributed to the State's existing Endangered Resources Donation Program (ERD); high end reflects those that had previously contributed. |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| Stevens et al. (1991) | *Species*:<br>Bald eagle<br><br>*Geographic Area*:<br>Massachusetts | Estimates the existence value of the Bald eagle by eliciting willingness to pay for a Massachusetts' restoration program. Respondents received introductory information about the species and were told that budget cuts had eliminated a program designed to aid the recovery of the eagle. Respondents were also told about a hypothetical private trust fund to preserve and protect the species. Without the fund the species would no longer exist in New England, though the creation of the fund did not guarantee survival of the species. Individuals were asked whether they would contribute a certain amount per year over the next five years to underwrite the fund. | *Sample Frame*:<br>Massachusetts households<br><br>*Sample Size*:<br>~113 completed surveys<br><br>*Response Rate*:<br>~22 percent<br><br>*Survey Mode*:<br>Mail<br><br>*Payment Vehicle*:<br>Annual contribution for five years to a private trust fund for management of the species | $19<br>(1990 dollars)<br><br>Annual mean willingness to pay for five year period |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| Carson et al. (1994) | *Species*:<br>Bald Eagles<br>Peregrine Falcons<br><br>*Geographic Area*:<br>California | Interim lost use valueas a result of PCB and DDT contamination. Respondents were told that injury had occurred to a number of species, including bald eagles and peregrine falcons as a result of contamination. Respondents were told that natural recovery of the species would require 15 years. Respondents were given the opportunity to vote for or against a government program financed by a one-time income tax surcharge per household that would guarantee a reduction in the natural recovery time from 15 to 5 years. Respondents were also told the program would reduce the level of injuries occurring during the 15 years of natural recovery. | *Sample Frame*:<br>English-speaking California households<br><br>*Sample Size*:<br>~2,800<br><br>*Response Rate*:<br>72.6%<br><br>*Survey Mode*:<br>In-person<br><br>*Payment Vehicle*:<br>A one-time state tax payment in payment card format (discrete-choice elicitation) | $55.61<br>(1994 dollars)<br><br>Lower bound mean one-time willingness to pay per household to enhance natural recovery of the species. This figure also includes the public's willingness to pay to enhance the recovery of two fish species: kelp bass and white croaker. |
| Kotchen and Reiling (2000) | *Species*:<br>Peregrine falcon<br><br>*Geographic Area*:<br>Peregrine Falcon range within State of Maine | Non-use value associated with restoring a self-sustaining, breeding population of Peregrine falcons in Maine. Respondents were provided with information about a recovery plan designed to increase the number of resident breeding pairs of falcons in Maine from 8 to 15. Respondents were asked to vote on a hypothetical future referendum to approve a statewide species protection fund to finance the recovery plan. Respondents voted yes/no to dollar amounts associated with a hypothetical one-time tax increase designed to underwrite the fund. | *Sample Frame*:<br>Maine residents over the age of 18 (licensed drivers)<br><br>*Sample Size*:<br>292 completed surveys<br><br>*Response Rate*:<br>~ 63.1%<br><br>*Survey Mode*:<br>Mail survey<br><br>*Payment Vehicle*:<br>One-time tax to underwrite a trust fund | $26<br>(1997 dollars)<br><br>Estimated mean willingness to pay for one-time tax increase |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| **WILLINGNESS TO PAY STUDIES THAT VALUE THE HABITAT OF THREATENED OR ENDANGERED BIRD SPECIES** | | | | |
| Loomis et al. (1996) [see also Giraud et al. (1999)] | *Species:*<br>Mexican Spotted Owl (Federally listed in 1993)<br><br>*Geographic area:*<br>Four Corners Region (AZ, CO, NM, UT) | Value of protecting 4.6 million acres of critical habitat for the Mexican Spotted Owl in the Four Corners Region. Respondents were provided detailed maps of the critical habitat units and background information on the species. Respondents were asked whether their household would contribute a set dollar amount each year to the Mexican Spotted Owl Recovery Trust Fund. The fund was to be used for recovery costs associated with managing critical habitat. Respondents were told that if a majority of households in the US voted to approve the fund, the species would be delisted in 15 years; if a majority voted against the fund, the species was likely to become extinct in 15 years. | *Sample Frame*:<br>Split evenly between households in Four Corners Region and all US Households<br><br>*Sample Size*:<br>754 returned surveys<br><br>*Response Rate*:<br>54 percent<br><br>*Survey Mode*:<br>Mail survey<br><br>*Payment Vehicle*:<br>Annual household payment to Trust Fund | $101<br>(1996 dollars)<br><br>Estimated annual willingness to contribute to a trust fund that provides financing for recovery of the species |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| Loomis and Ekstrand (1997) | *Species:*<br>Mexican Spotted Owl (Federally listed in 1993)<br><br>*Geographic area:*<br>Four Corners Region (AZ, CO, NM, UT) | Value of protecting 4.6 million acres of critical habitat units for the Mexican Spotted Owl in the Four Corners Region. Respondents were provided detailed maps of the critical habitat units and background information on the species. Respondents were asked whether their household would contribute a set dollar amount each year to the Mexican Spotted Owl Recovery Trust Fund. This fund was to provide for recovery costs associated with managing critical habitat. Respondents were told that if a majority of households in the US voted to approve the fund, the species would be delisted in 15 years; if a majority voted against the fund, the species was likely to become extinct in 15 years. | *Sample Frame*:<br>US Households<br><br>*Sample Size*:<br>286 returned surveys<br><br>*Response Rate*:<br>56 percent<br><br>*Survey Mode*:<br>Mail survey<br><br>*Payment Vehicle*:<br>Annual household payment to Trust Fund | $35 - $46<br>(1996 dollars)<br><br>Estimated household mean willingness to pay |
| Swanson (1993) | *Species*:<br>Bald eagle<br><br>*Geographic Area*:<br>1,000 acres of the Skagit River Bald Eagle Natural Area in Northwest Washington | Non-consumptive use value associated with Bald eagles in the Skagit River Bald Eagle Natural Area (SRBENA) in Washington State. Visitors to the SRBENA were offered a lifetime membership into a foundation which would buy land and manage the area for protection of bald eagles. Participants stated a maximum willingness to pay (or chose not to pay) for the preservation of a certain population of bald eagles, ranging from 50 to 400 birds. | *Sample Frame*:<br>Visitors to SRBENA<br><br>*Sample Size*<br>747 completed surveys<br><br>*Response Rate*:<br>51 percent<br>*Survey Mode*:<br>In-person<br><br>*Payment Vehicle*:<br>Lifetime membership in a trust fund to ensure continued existence of the species | $146 - $241<br>(1989 dollars)<br><br>Estimated one-time willingness to pay for a lifetime membership in a private nonprofit organization to protect Bald eagles at SRBENA (range represents alternative analyses of data) |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| Hagen et al. (1992) | *Species:*<br>Northern Spotted Owl (Federally listed in 1990)<br><br>*Geographic area:*<br>Pacific Northwest | Economic benefits of protecting the spotted owl and associated old growth forest habitat in the Pacific Northwest. Respondents were told that the owl acts as an indicator for the health of various other species found in this forest ecosystem. Respondents were provided background information on the costs (i.e. higher costs for unemployment compensation) and policies associated with a specific conservation strategy. Respondents were asked to vote yes/no to adopting the conservation policy given specific costs to households in the form of higher taxes and high prices for wood products. | *Sample Frame*:<br>US Households<br><br>*Sample Size*:<br>319 completed surveys<br><br>*Response Rate*:<br>46 percent<br><br>*Survey Mode*:<br>Mail survey<br><br>*Payment Vehicle*:<br>Higher taxes and higher wood-product prices | $86.32<br>(1991 dollars)<br><br>Estimated annual mean household willingness to pay to adopt a conservation strategy to protect the spotted owl (assuming non-respondents have a willingness to pay of $0) |
| Rubin et al. (1991) | *Species:*<br>Northern Spotted Owl (Federally listed in 1990)<br><br>*Geographic area:*<br>Pacific Northwest | Economic benefits of protecting the spotted owl and associated old growth forest habitat in the Pacific Northwest. Survey described spotted owl and its habitat as well as the competing commercial uses for the habitat. Respondents were asked to identify the maximum amount they would be willing to pay per year to be 100 percent certain that the spotted owl would exist in the future. Results for Washington residents were also extrapolated to the West Coast and the nation as a whole. | *Sample Frame*:<br>Washington State residents<br><br>*Sample Size*:<br>253 completed surveys (206 used to calculated WTP)<br><br>*Response Rate*:<br>23 percent<br><br>*Survey Mode*:<br>Mail survey<br><br>*Payment Vehicle*:<br>Hypothetical annual payment per household | $15, $20, $34, $36<br>(1987 dollars)<br><br>Estimated annual mean household willingness to pay to be certain that spotted owl will continue to exist in the future (range of values from high to low include residents of Oregon, Washington State, California, and the rest of the US) |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| Loomis and Gonzalez-Caban (1988) | *Species:*<br>Northern Spotted Owl (Federally listed in 1990)<br>California Spotted Owl (Petition for listing in April 2000)<br><br>*Geographic area:*<br>Pacific Northwest | Economic value of protecting spotted owl habitat of old growth forests from fire in California and Oregon. Participants reviewed information on a hypothetical fire prevention and control program that would reduce the amount of old growth forests that burned each year by 20 percent. Respondents were told that insufficient funds existed to achieve this level of fire protection and were asked to vote yes/no on whether they would pay a certain amount each year to help pay for the program. Willingness to pay responses were a function of the hypothetical acreage to be protected. | *Sample Frame*:<br>California and New England households<br><br>*Sample Size*:<br>672 completed surveys<br><br>*Response Rate*:<br>~46 percent<br><br>*Survey Mode*:<br>Mail and subsequent telephone interview<br><br>*Payment Vehicle*:<br>Hypothetical annual payment to fund fire prevention program | $56<br>(1995 dollars)<br><br>Estimated annual median willingness to pay per household for reducing acres burned by the sample average of 2,570 acres. Willingness to pay ranged from $6 (700 acres) to $80 (5,000 acres). |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| **OTHER ECONOMIC VALUATION STUDIES RELATED TO THE CRITICAL HABITAT FOR THE PYGMY-OWL** | | | | |
| Shafer et al. (1993) | *Species:*<br>Various species of birds of prey and waterfowl<br><br>*Geographic area:*<br>Central and Eastern Pennsylvania | Willingness to pay for use values associated with bird watching at two bird sanctuaries in Pennsylvania- Hawk Creek and Middle Creek. Sanctuaries include birds of prey (hawks, falcons, ospreys, eagles, etc) and migratory waterfowl (Canadian Geese, Snow Geese, etc). Uses travel cost method and total expenditures per visitor day for an alternative site to estimate additional amount typical visitors would have been willing to pay over and above actual expenditures. | *Sample Frame*:<br>Visitors to sanctuaries<br><br>*Sample Size*:<br>229 at Hawk Creek<br>41 at Middle Creek<br><br>*Response Rate*:<br>Non-response was negligible at all locations<br><br>*Survey Mode*:<br>In-person interview<br><br>*Payment Vehicle*:<br>Added travel costs | $3 - $12<br>(1988 dollars)<br><br>Estimated willingness to pay for typical visitors to two bird sanctuaries over and above actual spending |
| Butler et al. (1994) | *Species*:<br>Various species found at Pelee National Park Canada<br><br>*Geographic area*:<br>Southwest corner of Ontario, Canada | The net worth of bird-watching at Point Pelee National Park, an internationally recognized birding location. Respondents were asked how much their trip related expenditures could rise before they would decide not to come birding at Point Pelee. Respondent could answer in terms of actual dollars or as a percentage of their actual trip expenditures. | *Sample Frame*:<br>Visitors to Pelee National park<br><br>*Sample Size*:<br>603<br><br>*Response Rate*:<br>96 percent<br><br>*Survey Mode*:<br>In-person interview<br><br>*Payment Vehicle*:<br>Hypothetical additional trip expenditures | $256<br>(1987 Canadian Dollars)<br><br>Estimated per trip willingness to pay in additional hypothetical trip-related expenditures |

**Exhibit 6-2**

**SUMMARY OF STATED PREFERENCE LITERATURE RELATED TO BIRD SPECIES**

| Author | Species and Geographic Area | Key Issues Addressed in Survey | Survey Administration[a] | Range of Values |
|---|---|---|---|---|
| Richer (1995) | *Species:*<br>None. Study focuses on value of desert protection in general<br><br>*Geographic area:*<br>Southeastern California Deserts | Assesses the willingness to pay for desert protection in southeastern California. Participants were told about existing protections in the study area, which included National Monuments and National Scenic Areas, and told that a future policy would establish three new national parks and 76 new Wilderness Areas. The policy would restrict mineral extraction and recreational activities. Survey participants were asked whether they would vote for or against such a policy, and stated their willingness to pay in the form of increased taxes and/or higher mineral prices). | *Sample Frame*:<br>California residents<br><br>*Sample Size*:<br>356 completed surveys<br><br>*Response Rate*:<br>~38 percent<br><br>*Survey Mode*:<br>Mail survey<br><br>*Payment Vehicle*:<br>Increased annual taxes/mineral prices | $101<br>(1993 dollars)<br><br>Estimated annual willingness to pay per household to protect the desert ecosystem by restricting land use activities |

[a] Information provided under "Survey Administration" (e.g., sample size, response rate) are reported in the author's published article and may not be comparable across surveys.

## 6.3 Benefits Associated with Habitat Protection

### 6.3.1 Recreational Benefits

197. Protecting critical habitat for the pygmy-owl may result in preservation of habitat suitable for recreational uses, such as hiking, horseback riding, picnicking, and bird-watching. Project modifications involving the purchase of mitigation lands by residential developers may result in the preservation of areas to be designated as parks or preserves for both species conservation and public enjoyment. In addition, critical habitat designation may encourage the nature-based tourism in the region, which is dependent on the protection of open lands and uninterrupted landscapes. Southeastern Arizona is visited by 16 percent of all domestic overnight travelers to Arizona. These individuals are attracted to the region's natural beauty, cultural heritage, authentic desert resorts, eco-tourism, and birding (Arizona Department of Commerce (2002)). Conservation of desert ecosystems may contribute to the continuation and expansion of a tourist economy in Pima and Pinal Counties. Monetization of these benefits, however, would require data on the number of additional trips or increased quality of trips resulting from the designation. Such data are not currently available.

### 6.3.2 Real Estate Value Effects

198. Regional real estate values may be enhanced by critical habitat designation. Such enhancement may occur if open space is preserved (i.e. on-site mitigation or set-asides) or if allowable densities are reduced or kept at current levels as a result of the designation. Published studies have shown that open space creates important amenities that are reflected in land and housing values (Nelson et al., 2002). Increased open space within a region, created through the purchase of mitigation lands, may also enhance the viewscapes of homes. Quantification and monetization of these effects, however, would require detailed information on the existing housing markets in designated areas, such as the current availability of home-sites with these attributes.

### 6.3.3 Overall Ecosystem Health

199. Pygmy-owls are an integral part of the ecosystem in which they live and protecting the primary constituent elements for the pygmy-owl will benefit other organisms that cohabit these areas. Each one of these organisms may in turn provide some level of direct or indirect benefit to the public and local economies. Conservation recommendations such as minimized vegetation loss, revegetation, and habitat restoration/preservation contribute to the maintenance of biodiversity (Daily and Ehrlich, 1995) and collectively act to protect the desert ecosystem of Pinal and Pima Counties. The purchase of mitigation lands will also contribute to the preservation of desert ecosystems. While these benefits can be described qualitatively, existing data are not available to monetize these changes.

### 6.3.4 Ecosystem Preservation Values

200. Protecting critical habitat for the pygmy-owl may result in preservation of the desert ecosystem characteristic to Southeastern Arizona. Desert preservation can provide intellectual, aesthetic, cultural, spiritual and other values to the public (Munro (2002)). The natural habitat of the pygmy-owl is characterized by ironwood and cottonwood trees, saguaro cacti, and historic Native American sites which are all inherently part of Southeastern Arizona's cultural and scenic landscape. The public of the region may receive sizable economic value from knowing that the desert ecosystem will be available in the future (Loomis, 2000). Other studies, including Walsh (1984), Richer (1995), and Hagen et al. (1992) confirm the public's willingness to pay for ecosystem protection.

### 6.3.5 Other Benefits

201. Additional benefits of designating critical habitat for the pygmy-owl may include educational/informational benefits (increased awareness by the public of the extent of pygmy-owl habitat), increased support for existing conservation efforts, and reduced uncertainty regarding the extent of pygmy-owl habitat. Project modifications for residential development and park, monument, and refuge activities have included the creation of educational programs for the public. Critical habitat designation will also provide a firm legal definition of areas known to be essential to the survival and recovery of the species. This may assist agencies and local jurisdictions in defining key habitat areas for the species. County planners, therefore, may have better information to formulate their land use policies as a result of critical habitat designation. At this time sufficient information does not exist to quantify or monetize these benefits.

## 6.4 Existing Assessment of the Economic Benefits of Protecting Natural Resources in the Sonoran Desert

202. The Coalition for Sonoran Desert Protection recently issued a report entitled "Economic Benefits of Protecting Natural Resources in the Sonoran Desert" (ECONorthwest (2002)). This report provides a detailed discussion of the potential economic and social benefits that could arise from conservation of native habitats within the Sonoran Desert, based on the goals of the Sonoran Desert Conservation Plan. The proposed critical habitat for the owl is in a portion of the Sonoran Desert.

203. While the Coalition's report does not provide specific economic values for the types of project modifications expected to result under Section 7 (e.g., per acre values for owl habitat set aside from development), it does provide an extensive qualitative discussion of the potential economic and social benefits of desert conservation. For example, categories of benefits discussed include:

- **Use and non-use values for species and natural landscapes.** For example, desert protection may enhance the intrinsic values associated with native species and landscapes as well as recreational and aesthetic benefits.

- **Benefits to Taxpayers and Property Owners.** For example, urban sprawl may increase the cost of public services and public infrastructure, while proximity to open space can enhance regional property values.

- **Benefits to Local Economies.** For example, new jobs may be generated as a result of expenditures on resource conservation initiatives. Similarly, enhanced recreational opportunities may foster regional economic growth.

204. While the report cites several economic studies on the monetary values the public places on protecting species and desert land, it does not quantity these benefits as they relate specifically to the Sonoran Desert or provide information needed to quantify or monetize the economic benefits associated with this designation. In addition, some categories of potential benefits listed in this report are not well-defined or well-supported. For example, the authors suggest that land preservation may lead to human health benefits or may improve social cohesion within a community. However, without defined baseline conditions and acquisition scenarios, the link between land conservation and such benefits is speculative. Overall, this report serves as a source of qualitative information on the economic and social benefits that might result from the types of habitat preservation potentially associated with designation.

## 6.5 Placing Monetary Values on the Benefits of Section 7 Implementation

205. As discussed above, sufficient information does not exist to allow for quantification of the secondary benefits of habitat protection (e.g., recreational benefits, real estate benefits, overall ecosystem health, etc.). Thus, this section focuses on the public's willingness to pay for designation of critical habitat for an endangered bird species. This discussion is based on the existing economics literature, as gathered in the course of this analysis.

### 6.5.1 Benefits Transfer Overview

206. Since species conservation values are not generally observed in market transactions, economists rely on estimates of the public's willingness to pay developed using stated preference tools (e.g., contingent valuation surveys). The resources required to develop, pre-test, and administer a survey that assesses the benefits associated specifically with the proposed pygmy-owl designation is beyond the scope of this study.

207. When primary research is not possible, economists frequently rely on the method of benefits transfer. Benefits transfer involves application of results of existing valuation

studies to a new policy question.[165] For example, the economics literature provides a large number of studies that define the economic surplus associated with protecting threatened and endangered bird species or their habitat. Benefits transfer involves the transfer of these existing estimates of nonmarket values (the "policy case") to the case of critical habitat designation for the pygmy-owl (the "study case") (Boyle and Bergstrom, 1992). Two core principals of defensible benefits transfer are (1) the use of studies that apply acceptable techniques to generate welfare values, and (2) similarity between the good being valued in the literature and the good being valued in the policy context to which the transfer is being made (i.e,. the protection afforded the pygmy-owl by critical habitat).

### 6.5.2 Application of Benefits Transfer to the Pygmy-Owl

208. This section provides a literature summary identifying relevant and comparable studies that present a range of economic values associated with the protection of threatened, endangered, or sensitive bird species or their habitat. Based on this review, two studies are identified that provide values applicable to assessing the monetary benefits provided by section 7 protections for the pygmy-owl. The quality of these studies is assessed against generally accepted criteria for defensible contingent valuation. Finally, aggregate estimates of the public's willingness to pay for conservation of pygmy-owl critical habitat are developed by multiplying the per-household benefit estimates provided by these studies by the number of affected households.

209. It is noted that while contingent valuation provides a useful method for estimating a full range of values (i.e., use value, non-use value, existence value, etc), the reliability and validity of this method has been the subject of much controversy (Diamond and Hausman (1993), Clark et al. (2000)). Some economists express particular concern about the ability of the method to provide meaningful estimates of non-use values for public goods. The debate primarily focuses on whether respondents can provide reliable estimates of the value of these types of goods, given that the public has little or no experience with purchasing such goods. Critics note that for a variety of reasons, respondents' stated intentions may not equal true willingness to pay. Observers have noted that respondents may not carefully consider personal budget constraints when stating willingness to pay. Likewise, individuals' bids may be affected by the "warm glow" of giving. That is, bids may reflect individuals' interest in contributing to a worthy cause rather than their true value for the resource in question. These and other adjustments should be considered in the context of this discussion.

210. Exhibit 6-2 summarizes several studies reported in the literature that attempt to estimate the non-use value the public holds for preservation of various threatened bird species, their habitat, and associated recreational activities (i.e. bird watching). Although

[165] For more discussion of benefits transfer, see Environmental Protection Agency, *Guidelines for Preparing Economic Analyses* (EPA 240-R-00-003), September 2000.

each study addresses, to some extent, the valuation of threatened or endangered bird species, several of these studies are more applicable to the case of the pygmy-owl than others. For example, Bowker and Stoll (1984) assess the value bird watchers and non-recreational users place on the existence of the whooping crane, a migratory waterfowl species commonly observed along a migratory route from Canada and Texas. Survey participants were asked to imagine a scenario in which public funding to monitor and maintain a viable population of whooping cranes was terminated, resulting in the extinction of the species. Specifically, respondents were asked to accept or reject an offer to contribute annually to a trust fund that would purchase land so that the species might be preserved in the future. Respondents indicated a willingness to pay of between $21 and $63 (1983 dollars) for this fund. Krotchen and Reiling (2000) examine the value Maine residents ascribe to the recovery of the peregrine falcon, a large bird of prey whose population in the State had dwindled to approximately eight mating pairs in the late 1990s. Survey respondents were asked to vote yes or no to a one time tax, the revenues from which would be used to establish a statewide species protection fund to finance a recovery plan. Respondents were told that the fund would only be established if a majority of voters approved it. Respondents to this survey indicated a mean willingness to pay of $26 (1997 dollars). Other willingness to pay studies focus on three subspecies of spotted owls (Rubin et al. (1991), Hagen et al. (1992), Loomis et al. (1996), Giraud et al. (1999), Loomis and Ekstrand (1997)) or more generally on the desert ecosystem habitat (Richer (1995)). These studies provide a range of potentially applicable willingness to pay values associated with protecting the endangered pygmy-owl.

211. As demonstrated in Exhibit 6-2, estimated values for conservation of bird species and their habitat vary widely between studies. The observed differences are a function of such factors as: the good being valued (e.g., continued existence of the species, protection of existing habitat from development or wildfire, the acquisition of new habitat, reduction of future bird injuries resulting from toxic contamination); the payment vehicle (e.g., tax referendum, request for donation to a private fund); the sample frame used for the survey (e.g., bird sanctuary visitors, New England households, California households, U.S. households, etc), and the elicitation format (e.g., referenda, double bounded dichotomous choice). Importantly, in some cases the reported values reflect actions to preserve more than one bird species. Note that the reported willingness to pay values associated with the critical habitat for the three subspecies of owls considered in the literature are within the same order of magnitude: northern spotted owl ($54 to $147); California spotted owl ($77), and Mexican spotted owl ($53 - $132).[166]

212. For purposes of this economic analysis, the most relevant existing literature involves a set of studies that assessed the economic benefits of designating critical habitat for the Mexican spotted owl in the Four Corners region (Loomis et al. (1996), Giraud et al. (1999)

[166] The willingness to pay figures represent 2001 dollars and are adjusted with the GDP Deflator as reported in Council of Economic Advisors (2002).

and Loomis and Ekstrand (1997)). The environmental good valued in these studies (the designation of critical habitat for the Mexican spotted owl) is sufficiently similar to consider a benefits transfer to the case of the pygmy-owl. Exhibit 6-3 provides a summary comparison of the key attributes associated with each environmental good.

213. Loomis et al. (1996), Giraud et al. (1999) and Loomis and Ekstrand (1997) focus on the value of protecting 4.6 million acres of critical habitat in Arizona, New Mexico, Colorado, and Utah. The survey provided participants with detailed maps of the proposed critical habitat units, information on current threats to the species, benefits provided by the species, and an explanation of the potential for species extinction. Respondents were told about a Mexican spotted owl recovery federal trust fund that would help to maintain 4.6 million acres of critical habitat and fund habitat protection measures (i.e. fire prevention, etc). Respondents were then asked if their household would contribute a set dollar amount each year to the trust fund.[167] Respondents were told that if a majority of households in the U.S. voted to approve the fund, the species would be delisted in 15 years; if a majority voted against the fund, the species was likely to become extinct in 15 years. Respondents indicated a willingness to pay of between $50 and $130 (2001 dollars).

[167] The three Mexican spotted owl studies cited in this report differ only in the elicitation method used. Loomis and Ekstrand (1997) use a multiple-bounded willingness to pay approach. That is, each respondent was asked if he/she would contribute a certain amount to a Mexican spotted owl recovery trust fund. If they said no to the initial amount, a lower amount was asked; if they said yes to the initial amount, a higher amount was asked. Giraud et al. (1999) and Loomis et al. (1996) utilize a dichotomous choice approach (i.e. the respondent is simply asked whether or not they would contribute to the Mexican spotted owl recovery trust fund at a given dollar amount, which varied by respondent).

| Exhibit 6-3<br>COMPARISON OF GOODS VALUED IN AVAILABLE LITERATURE<br>VERSUS PYGMY OWL POLICY CONTEXT | | |
|---|---|---|
| **Attribute** | **Mexican Spotted Owl Study** | **Pygmy-owl Policy Context** |
| Geographic area | Arizona, New Mexico, Utah, Colorado | Arizona |
| Year species was listed | 1991<br>(56 FR 56344). | 1997<br>(62 FR 10730) |
| Year critical habitat was proposed | 1995<br>(Finalized in 2001) | 1999<br>(Re-proposed in 2002) |
| Species habitat type | Mountainous forests and deep canyons; favors large diameter and mature tree forests (e.g., conifer, ponderosa pine, gambel oak) | Riparian woodlands (e.g., cottonwoods, willows); semidesert grassland; Sonoran savanna grassland; desert scrub (saguaros, organ pipe cactus, mesquite bosques) |
| Acreage of critical habitat | 4.6 million acres<br>(2 million in Arizona) | 1.4 million acres |
| Acreage of designation in federal ownership | 3.6 million acres<br>(79% of critical habitat) | 863 thousand acres<br>(60 % of proposed) |
| Total population of birds (within and outside of CH) | Unknown | <50 birds[a] |
| Owl species found elsewhere (i.e. non-threatened populations outside of the designated critical habitat) | Various parts of Mexico | Found in Texas (where the species is not a listed species) and various parts of Mexico |
| Common threats to habitat | Logging practices (e.g., even-aged silviculture); catastrophic wildfire | Residential development |
| [a] Arizona Game & Fish Department (2002). | | |

### 6.5.3 Applying Contingent Valuation Guidelines To Selected Studies

214. Given that the Mexican spotted owl studies are relevant to the case of the pygmy-owl, the next step in the benefits transfer methodology is to assess the quality of these studies. Most economists agree that contingent valuation studies should adhere to generally accepted conventions and protocols. Mitchell and Carson (1989) identify a number of guidelines for the development of a robust and credible survey mechanism.[168] For example, surveys should be pre-tested and revised before actual survey administration in order to

[168] See also Arrow et al. (1993).

refine elicitation format (i.e., the style and content of the willingness to pay question), the sample size should be large enough to allow for credible extrapolations, and response rates should be as high as possible. Exhibit 6-4 below summarizes these criteria and assesses the extent to which the Mexican spotted owl studies adhered to these conventions. Overall, for purposes of this economic analysis, these two existing studies demonstrate sufficient quality and adherence to standard practices.

215. As noted, Loomis et al. (1996) and Loomis and Ekstrand (1997) provide mean willingness to pay estimates of approximately $50 and $130 (2001) dollars. Multiplying the low-end figure by the total number of households in the US provides national benefit estimates associated with protecting Mexican spotted owl habitat of $2 billion. Note that the authors of both studies provide conservative (i.e. lower bound) estimates of national benefits by assuming that non-respondents and protest bids have a valid willingness to pay of zero dollars.[169] The authors conclude that the national benefits associated with critical habitat could reasonably be expected to be in the low billions of dollars annually (2001 dollars).

[169] The average response rate for the surveys was approximately 55 percent. Therefore, the aggregate estimate of benefits extrapolates to approximately half of the US population. Further, Loomis et al. (1996) indicate that 31 percent of the willingness to pay responses were "protest bids,"defined as an invalid representation of an individual's true value for a good. Participants that signaled "protests" against the simulated market through answers to a multiple choice question (i.e. "I am opposed to paying for this government program") were left as zeros values, rather than adjusting their response to the mean willingness to pay. As such, the overall mean willingness to pay can be considered conservative (i.e. lower bound).

**Exhibit 6-4**

**CONTINGENT VALUATION SURVEY GUIDELINES AND APPLICATION TO THE MEXICAN SPOTTED OWL STUDIES**

| Guidelines | Comments and Description | Application of Guidelines to the Mexican Spotted Owl Studies[a] |
|---|---|---|
| **Sample Design and Survey Administration** | | |
| Personal Interviews | Personal interviews (preferably face-to-face) are needed to ensure adequate response rates, allow presentation of more complete information and motivate respondents to take the valuation task seriously. | *No* - mail survey[b] |
| Pretesting | Pretesting is needed to: (a) ensure that respondents understand the scenario and the questions as presented in the questionnaire; (b) assess whether the presence of the interviewer affects responses; (c) evaluate the reactions of respondents to photographs, or other graphics used in the survey. | Loomis et al. (1996), Giraud et al. (1999):<br>*Yes* - Focus groups held in Fort Collins, CO, Albuquerque, NM, and Phoenix, AZ to develop pre-test survey, which was administered through telephone interviews. Final survey also adjusted bid amounts in light of pre-test results and previous research on the economic value of California and northern spotted owls.<br><br>Loomis and Ekstrand (1997):<br>*Yes* - Mailed pilot survey to a sample of U.S. households and conducted interviews over the phone. Finalized survey based on feedback. |
| Probability Sampling | The survey should apply probability sampling techniques to obtain a representative sample; the sampling frame should include the population relevant to the valuation issue. | Loomis et al. (1996), Giraud et al. (1999), Loomis and Ekstrand (1997):<br>*Partially* - Survey Sampling, Inc. (a national survey firm) provided a systematic sample of US households and Four Corner households. However, telephone book addresses tend to result in over-sampling of males; mail surveys tend to over-sample individuals with higher education level, income, and age. |
| Large Sample Size | The sample size should be large enough to obtain statistically reliable results. The appropriate sample size depends on the required precision of the resulting estimates and the sampling procedure applied. | Loomis et al. (1996), Giraud et al. (1999):<br>*Yes* - Sample size of 1600.<br><br>Loomis and Ekstrand (1997):<br>*Yes* - Sample size of 1200. |

**Exhibit 6-4**

**CONTINGENT VALUATION SURVEY GUIDELINES AND APPLICATION TO THE MEXICAN SPOTTED OWL STUDIES**

| Guidelines | Comments and Description | Application of Guidelines to the Mexican Spotted Owl Studies[a] |
|---|---|---|
| High Response Rate | The survey design should minimize the non-response rate to ensure unbiased and reliable results. | Loomis et al. (1996), Giraud et al. (1999):<br>*No* - 54 percent overall; lower than desirable to generalize sample results to the population (an incentive in the first mailing was used to encourage responses)<br><br>Loomis and Ekstrand (1997):<br>*No* - 56 percent overall; lower than desirable to generalize sample WTP to the population (an incentive in the first mailing was used to encourage responses) |
| **Description of Commodity and Market** | | |
| Accurate Description of Commodity | The survey should provide adequate and accurate information on the nature and relative magnitude of the problem being addressed. | *Yes* - color maps depicting critical habitat and sufficient background information on threats to the species and potential for extinction. |
| Budget Reminders | The survey should remind respondents that payments for the good in question reduce funds available for other private and public goods. | *No* |
| Reminder of Substitute Commodities | The survey should remind respondents of substitute goods and services to ensure that respondents consider alternatives before estimating willingness to pay. | *No* |
| Exclusion of Transaction Value | The survey should ensure that respondents provide amounts that reflect the economic value of the good in question, not values associated with the transaction such as the "warm glow" of charitable giving or the desire to punish polluters. | *No* |
| Payment Vehicle and Schedule | The survey should define a neutral payment vehicle that is not likely to bias responses and should explicitly state the frequency of payments. Research indicates that soliciting annual payments is the conservative (i.e. lower bound) approach. | *Yes* - Solicits annual payment and notes explicitly that by law, the funds could only be used to improve habitat for the owl |

**Exhibit 6-4**

**CONTINGENT VALUATION SURVEY GUIDELINES AND APPLICATION TO THE MEXICAN SPOTTED OWL STUDIES**

| Guidelines | Comments and Description | Application of Guidelines to the Mexican Spotted Owl Studies[a] |
|---|---|---|
| Timing Issues Addressed | The survey should provide information on time-related dimensions of the good or service being offered (i.e. when and how frequently the good or service will be provided). | *Yes* - states that an annual contribution would maintain 4.6 million acres of habitat, fund habitat protection (i.e. ban clearcutting within critical habitat units), and provide for the recovery and delisting of the species within 15 years or so. |
| **Value Elicitation** | | |
| Willingness to Pay Format | Willingness to pay values tend to be lower than willingness to accept estimates and thus represent the conservative (i.e. lower bound) choice. | *Yes* - uses two willingness to pay elicitation methods: multiple-bounded and dichotomous choice. |
| Referendum Format | Referenda (voting "yes" or "no" to be taxed for a specific purpose) are more familiar and realistic than other approaches and less subject to strategic bias. | *Yes* - asks respondents to vote yes/no and states that protection will only be afforded if a majority of households vote to approve funding for the hypothetical program. |
| No-Answer Option | The referendum should offer a "no-answer" response option to ensure that the survey elicits meaningful responses. | *Partially* - does not provide option for "no response" but inquires about respondent certainty regarding their answer |
| Follow-Up Questions | To detect sources of bias and scenario rejection, the survey should ask respondents to indicate the reason for their response to the referendum question (e.g., to differentiate actual zero bids from protest bids or scenario rejection). | *Yes* - requests respondent to identify from a list the reason why they may have voted against the referenda; also requests respondent to state their level of certainty (on scale of 1 to 10) regarding their answer to the willingness to pay question |
| Respondent Characteristic Data | The survey should include questions on income, age, attitudes toward the issues assessed, household size and other variables to assist in interpreting responses. | *Yes* |
| Conservative Design | When aspects of survey design (or analysis) are ambiguous, the researcher should apply the option that tends to underestimate willingness to pay. The researcher should provide information and word questions in a neutral manner, or at least in a manner that will not bias responses upward. | *Yes* - assumes non-respondents had a $0 willingness to pay and relies on low-end estimate when extrapolating to the national level; retains protest bids (i.e. willingness to pay equals zero) rather than adjusting the amount to the mean willingness to pay. |

**Exhibit 6-4**

**CONTINGENT VALUATION SURVEY GUIDELINES AND APPLICATION TO THE MEXICAN SPOTTED OWL STUDIES**

| Guidelines | Comments and Description | Application of Guidelines to the Mexican Spotted Owl Studies[a] |
|---|---|---|
| **Evidence of Validity and Reliability** | | |
| Understanding and Acceptance | The study should provide evidence that respondents understood and accepted the problem description and scenario presented. | *Yes* - preliminary questions inquire about respondent's attitudes and perceptions of endangered species; inquired about understanding of threatened and endangered species (i.e. the Northern spotted owl and Mexican spotted owl) |
| Adjustments for Biases | Researchers should test for potential biases and adjust the results to address these biases where appropriate. Evidence of significant bias indicates that the results are less reliable. | Not reported. |
| Treatment of Outliers and Protest Bids | The study should describe the specific criteria applied to identify outliers, protest bids or inconsistent bids, and the method employed should be widely accepted by researchers. High numbers of these bids suggest that respondents did not understand or accept the scenario. | *Yes* - follow up questions identify protest responses (i.e. "I want the timber harvest to continue on these acres" or "I am opposed to paying for this government program"). Protest responses were left in the sample as zero values rather than adjusting to the mean willingness to pay. Protest responses totaled 31 percent, which is above the normal level of protest responses. |
| Internal Consistency of Bids | Researchers should perform tests and present economic theory and rational choices as one test of the reasonableness and validity of results. | *Yes* - utilizes multi-variate logit equations to assess reasonableness of responses (i.e. that the higher the dollar amount respondents were asked to pay, the less likely respondents were to vote for the program). |
| Consistency with Economic Theory | The results should be consistent with economic theory and rational choice as one test of the reasonableness and validity of results. | Yes. |
| Other Evidence of Reliability and Validity | Other measures of reliability and validity should be provided where relevant to the study design. | Yes |

**Exhibit 6-4**

**CONTINGENT VALUATION SURVEY GUIDELINES AND APPLICATION TO THE MEXICAN SPOTTED OWL STUDIES**

| Guidelines | Comments and Description | Application of Guidelines to the Mexican Spotted Owl Studies[a] |
|---|---|---|
| Consistency with Results of Other Studies | The results should be consistent with findings from other studies to provide evidence of the validity of the results. | Yes - average annual willingness to pay for the Mexican spotted owl ($53 to $132) compare favorably to the studies done for the Northern spotted owl ($54 to $147) and the California spotted owl ($77).[c] |

[a] Note that the three Mexican spotted owl studies cited in this report involve two different willingness to pay elicitation methods. Loomis and Ekstrand (1997) use multiple-bounded willingness to pay estimates (i.e., the respondent was asked if he/she would contribute a certain amount to the Mexican Spotted Owl Recovery Trust Fund. If they said no, a lower amount was asked; if they said yes, a higher amount was asked). Giraud et al. (1999) and Loomis et al. (1996) utilize a dichotomous choice approach (i.e., the respondent is simply asked whether or not they would contribute to the Mexican spotted owl recovery trust fund if it cost $X a year. The bid amount was randomly assigned to surveys).

[b] Recent research has indicated that in-person surveys are not necessarily to be preferred over well designed, well executed self administered and mail surveys (see Leggett et al. (2002)).

[c] Figures are presented in 2001 dollars using the GDP Deflator, see Council of Economic Advisors (2002).

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